MARCH, 1944

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TOOL & DIE JOURNAL

TOOLING AND PRODUCTION

PUTNAM END MILL

OR ANY ONE OF

760

OTHER STANDARD TOOL

CAN BE

DELIVERED TO YOU WITHIN

48 HOURS

Hi-speed end mills . . . continuous pilot counterbores . . . spiral fluted chucking reamers . . . are all available for immediate delivery from factory and dealers' stocks. Included as standard are all the popular sizes and types and many, which from any other source, would be considered special tools.

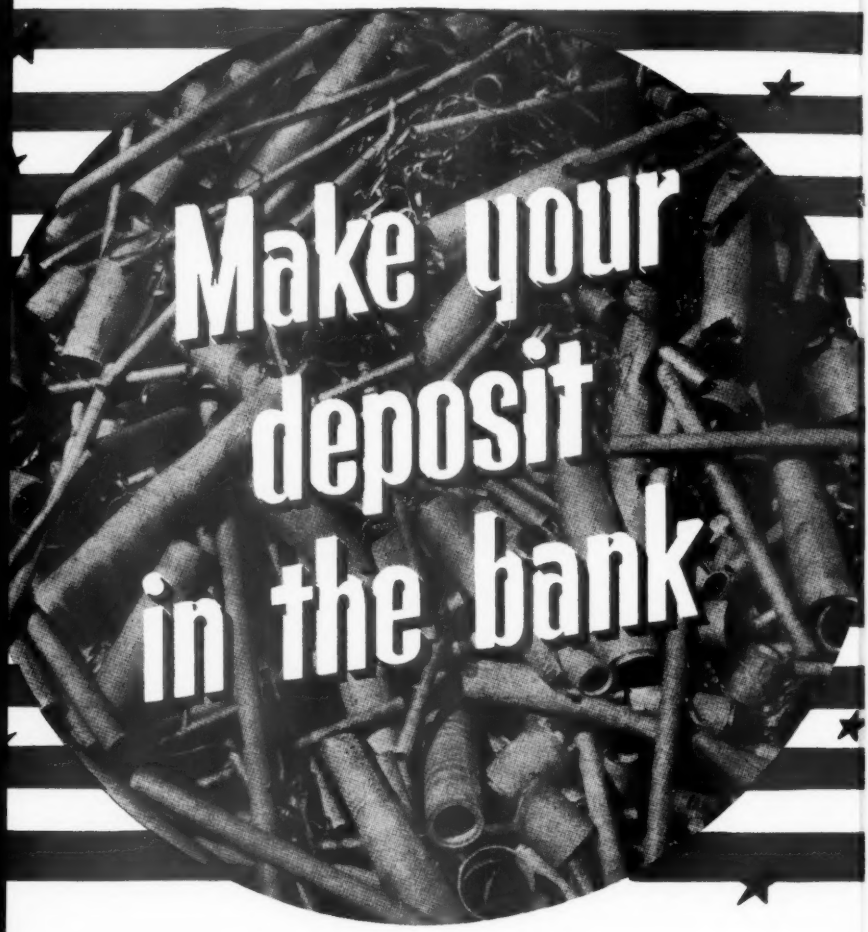
For the jobs on which you need the best in fast cutting, long lasting tools, Putnam can meet your exact needs without delay. See your Putnam representative, or phone, wire or write directly to the plant.

TODAY OUR CATALOG
IS OUR STOCK LIST

ARMY E NAVY

PUTNAM TOOL COMPANY

2985 CHARLEVOIX AVE. • DETROIT 7, MICH.



HE VICTORY SCRAP BANK DRIVE IS ON NOW

CRAP piles have taken on a new significance these past few years. Far from being regarded as useless junk, they have become vital tional resources. To produce the extra millions of tons of steel needed r war now and in 1944 will require a proportionate amount of scrap. the outset of the war huge stockpiles were quickly collected from vious junk scattered plentifully everywhere. Certainly it's more fficult to find this much needed scrap today, unless you are constantly arching for it. So make it a point to clean out your shop (and your me) regularly of all but the absolutely essential metal. Deposit this in e Victory Scrap Bank . . . a deposit that will pay you *real dividends.*

Allegheny Ludlum
STEEL CORPORATION
BRACKENRIDGE, PENNSYLVANIA

HARDINGE Precision Collets
for all makes of Lathes and Milling Machines
HARDINGE
ELMIRA, N.Y.
Style "B" Master Feed Fingers and Pads
HARDINGE Precision Collets and Feed Fingers for
all makes of Automatics, Turret Lathes and Chucking Machines
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Master Collets and Pads
"PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR HARDINGE"

"Sure—I was from Missouri"

If you, too, are from Missouri, here's the wheel for you! And, don't be satisfied with just better than your usual performance. We urge you to be brutally skeptical and critical. Try this wheel as you've never tried any others! Give it the works! Send for the Por-os-way booklet "Facts About Por-os-way", with the "prescription blank." Order a trial lot! Then make your toughest test yourself!

CHIP CLEARANCE DOES IT!

Grinding wheels, like lathe tools, need clearance. The Por-os-way wheel provides chip clearance, NATURALLY.

THIS MAKES THE DIFFERENCE

You can easily spot the difference between an ordinary wheel (top) and a Por-os-way wheel (bottom). Por-os-way's extra porosity gives you more than 8 distinct operating advantages.

*T.M. Reg. U.S. Pat. Off. Copyright, 1944, A. P. de Sanno & Son, Inc.

2 TO 5 TIMES MORE PRODUCTION

Por-os-way often enables you to *rough grind* with the same fine grain wheel you select for precision finishing.

RADIAC*

POR-OS-WAY*

A. P. DE SANNO & SON, INC.

464 Wheatland St., Phoenixville, Pa., Since 1893

New York · Pittsburgh · Cleveland · Detroit
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Radiac POR-OS-WAY · Radiac PARAFLEX · Radiac Mounted Points and Mounted Wheels · Radiac Internal Grinding Wheels
Radiac Abrasive Cut-Off Machines and Discs

Por-os-way Users List Reads Like a Blue Book of American Industry. A few are:

E. C. Atkins & Co. · Bell Aircraft · Edward G. Budd Mfg. Co. · Buick Motor Division of General Motors · Kinner Motors, Inc. Studebaker Corporation · Thompson Aircraft Products · Wadell Engineering Co. Westinghouse Electric · Wright Aeronautical

...known as super tools be... they cut so clean, fast and long, Progressive "Shear-Cut" End Mills are working overtime on superior American armament.

Precision made of the finest high-speed tool steel, these end mills feed accurately, minimize chatter, give uniform cutting action and adequate chip clearance . . . permit working to extremely close limits.

Progressive "Shear-Cut" End Mills are now manufactured by the Siewek Tool Division of Domestic Industries, Inc. . . . the same high character product, the same old family of skilled workers—plus the wider resources of Domestic Industries, Inc. for added manufacturing facilities and improved customer service.

When you need end mills, think of "Shear-Cut." Their superiority is being proven daily in leading war plants all over the country.

SIEWEK TOOL DIVISION
OF DOMESTIC INDUSTRIES, INC.
Detroit (Ferndale Station) Michigan
Designers and Builders of JIGS, FIXTURES AND SPECIAL MACHINES
Distributors in Principal Cities
Affiliated with SIEWEK ENGINEERING DIVISION • Chicago, Detroit, Hartford, Conn. and Springfield, Mass.

8 at a time
Today Lapointe broaches and broaching machines are producing more precision parts than previous methods of machining. Typical of these production installations are the .4L Broaching Machines at the Springfield Arsenal that are making the apertures for Garand rifles. Shown on the face plate of the machine above is the ring before and after spline broaching. This ring is made from a forging ground to correct thickness. It is then spline broached and each finished ring makes 8 parts. This 8-at-a-time production accounts for 2,240 component parts per hour in one single high speed operation.

ARMY NAVY

LAPOINTE Machine Tool Company

HUDSON, MASSACHUSETTS, U. S. A.

NEW TOOLS FOR OLD

FOR ONLY 15 CENTS★ ON THE DOLLAR!

REGRINDING BY NEW TOOL CRAFTSMEN

As originators of Midget Milling cutters, Severance tool makers have the "know-how" when it comes to regrinding worn, dulled tools.

In the regrinding of a worn tool the process is the same as the grinding of a new one. Each flute must have the correct pitch and depth so the finished tool will take deep, sharp bites without chatter.

After being accurately reground, your renewed tools are further improved by the "Severite" heat treat process that gives additional hardness to the teeth and increases the cutting life from three to five times.

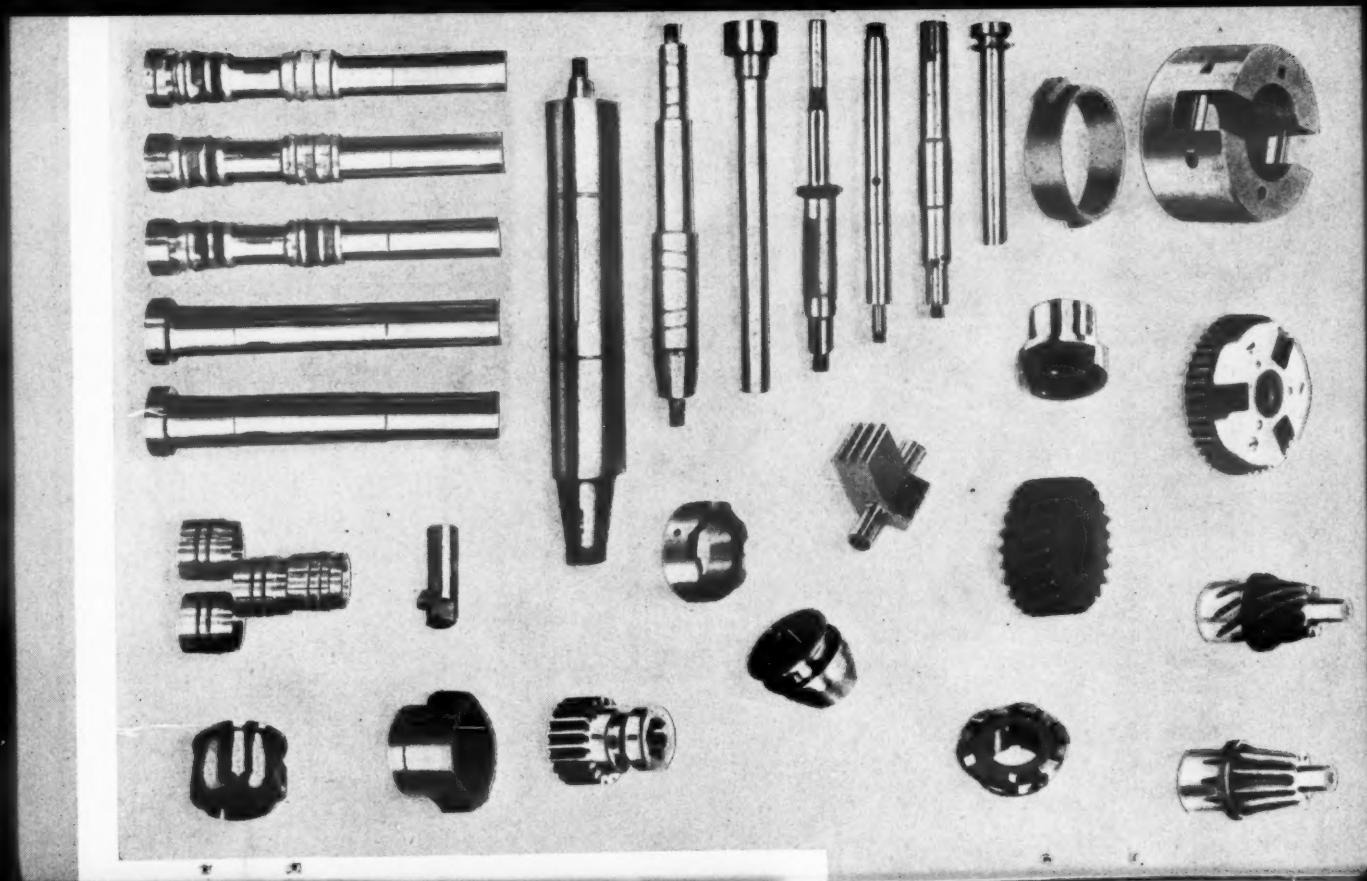
Worn rotary files, can also be converted into sharp, good-as-new Midget Milling cutters by Severance craftsmen.

Check up on the worn and dulled tools in your plant now. For best service, send them to the Severance plant nearest you for a factory regrinding job.

★ OUR LIST PRICE.

Severance

Severance Tool Industries Inc., Saginaw, Michigan. Plants in Long Island City, N. Y.; Detroit, Michigan; Fort Wayne, Ind.; Chicago and Los Angeles.



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. . . STANDARD MACHINES
Power Presses, Grinders, Milling Machines, Automatic Lathes and Screw Machines.

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meets the urgency of your need—day and night.

20,000 parts drawings.

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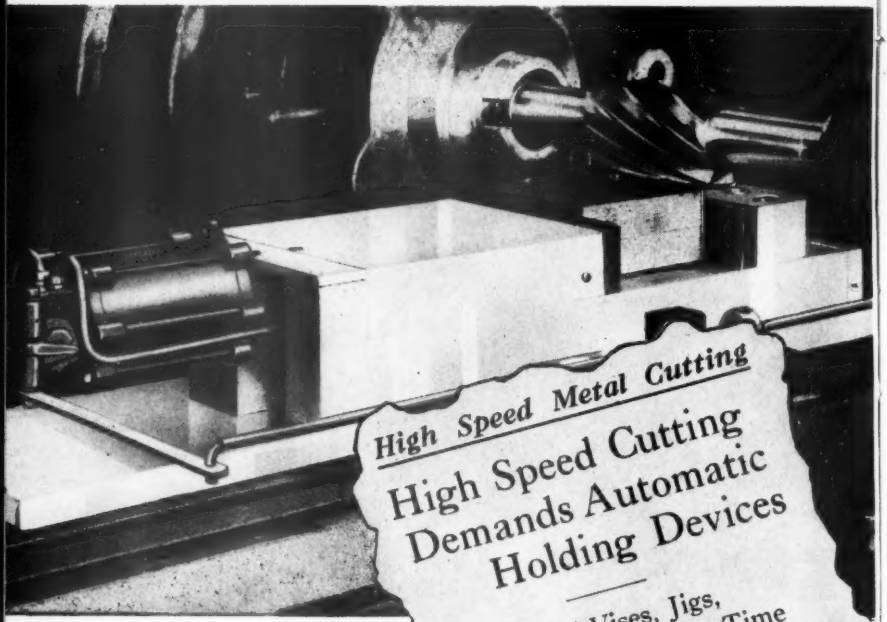

High Speed Metal Cutting

High Speed Cutting Demands Automatic Holding Devices

Air Operated Vises, Jigs, Fixtures Cut Loading Time and Lessen Worker Fatigue

AKRON, O.—Automatic opening and closing vises, jigs and fixtures, synchronized with the movement of the machine, are proving as important as the new high speed metal cutting tools in America's almost fantastic production records. These new devices, operated by air-power, frequently cut machine loading time in half, actually add from four to six hours extra cutting time to an eight hour machine shift.

Investigate these famous Bellows-Senacon automatic air-operated holding devices for speeding production by machine tools:

The CVH-60 Milling Machine Vise — clamping pressures as high as 40,000 pounds

The CV-40 Air Vise — a ready made jig for holding small parts

The BF-60 and 90 Drill Press Feeds — for advancing cutting tools automatically

The Bellows-Senacon Air Motors — to operate custom-made jigs and fixtures

Write for new Free Bulletins today!

The Bellows Co.

ESTABLISHED · 1911

861 EAST TALLMADGE AVENUE, AKRON, OHIO

Fill 'Em Full of Holes!

That's what Mosquito Bombers are doing to German fighter planes. But it took this Lempco Reamer to break the bottleneck on the tailfork production line in the Mosquito plant. Ordinary reamers couldn't make the right kind of holes, fast enough, in Durol split bushings.

REAMS 2 WAYS SIMULTANEOUSLY

The Lempco Hi-Speed Steel Expansion Reamer has three blade segments, two of which spiral in a direction opposed to that of the third, shearing a mirror-smooth finish on any machinable metal.

DUAL-SPIRAL REAMERS . . .

★ *Adjustable for Size Instantaneously on the Job!*

★ *Makes Clean Holes.*

★ *Eliminates Costly Wear on Plug Gauges caused by Abrasive Left in Honed Holes.*

★ *Removable Blades are Easy to Resharpen.*

★ *Extension Pilots for Alignment Jobs.*

★ *.050" to .080" Straight Line Expansion* (in both radial and chordal planes).*

★ *Reams Smoothly over Keyways and Split Bushings.*

**Sizes under 11/16" slightly less.*

WRITE FOR SPECIFICATIONS

LEMPCO

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ANODIZING by Advance

Anodizing produces a coating which is applied electrolytically to aluminum and aluminum alloys. In War or Peace, anodizing safeguards men and machines and provides . . .

- *Maximum protection against corrosion.*
- *Compliance with Army-Navy specifications AN-QQ-A-696-a.*
- *An excellent base for paint adhesion.*
- *An insulating coating which will not conduct electricity.*
- *A hard coating which resists abrasion.*

The Advance Plating Company is prepared to supply you with a complete, modern, *and fast* anodizing service. Five large units operate 24 hours a day. "Still" tanks handle forgings, extrusions, castings, stampings and machined parts in all shapes and sizes up to 14 feet long. For low-cost processing of small parts—rivets, washers, screws, nuts, and machine screw parts—the "basket" (bulk) method of anodizing is available. Modern equipment, experienced personnel, and complete technical control insure perfect workmanship.

APCO is the sign of Quality . . . but Quality *and Service* go together at Advance! If you need parts in a hurry, Advance will get them out quickly . . . within a matter of hours if necessary . . . and our research and development department is always ready to help you solve your difficult finishing problems. Write, wire, or 'phone for an Advance engineer to visit your plant and talk over your requirements.

ATTENTION POSTWAR PLANNERS!

Are you planning to use aluminum in postwar conversion? It is light, strong and durable. An Advance engineer can assist you in providing an attractive finish.

APCO

THE *Advance* PLATING COMPANY

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CONTINUOUS CUTTING MEANS TOP PRODUCTION

WELLS NO. 8

CAPACITY
8"x16" RECTANGULAR
8" DIAMETER, ROUND

The metal cut-off band saw principle, in use on all Wells saws, provides maximum production and economical operation through its continuous cutting action. This featured principle, CONTINUOUS CUTTING, is recognized by engineers as being the chief factor in efficient operation. EVERY TOOTH in the blade band does its SHARE OF CUTTING. No lost cutting contact.

The new Wells catalog will give you complete details on all Wells Metal Cutting Band Saw Products. Write for FREE Copy.

Wells SAWS

Wells

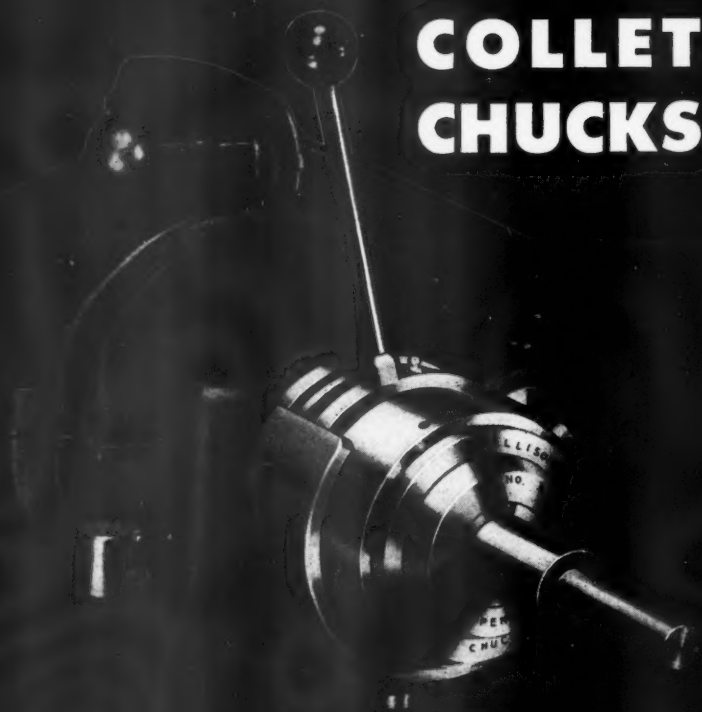
Products by Wells are Practical

METAL CUTTING BAND SAWS

WELLS MANUFACTURING CORPORATION
1940 ASH STREET, THREE RIVERS, MICH.

TWO NEW

COLLET CHUCKS



MODEL #3

TWO NEW DESIGNS AND SIZES—HERE'S WHY! There are no cams, wedges or dogs, no dies or operating wrench, no stock stoppers. A new short handle operating a full circle can give correct collet pressure when working either hard or soft materials. There's no awkward reaching for handle—a short pull toward operator tightens collet—a push away from operator releases it. Convenient and safe for unskilled operators. All-Allison Collet Chucks are of alloy steel construction, hardened and ground to insure superior wear—and to maintain accuracy in production.

MODEL #3—For 1 ½" 8-thread spindle nose—with ¾" collet capacity uses same collets as in our #1 model Allison Chuck.

MODEL #2—For 2 ½" spindles and under—with 1 ¼" collet capacity.

Write for the new Allison catalogue or SEE YOUR LOCAL DISTRIBUTOR

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TOOL AND ENGINEERING CO.

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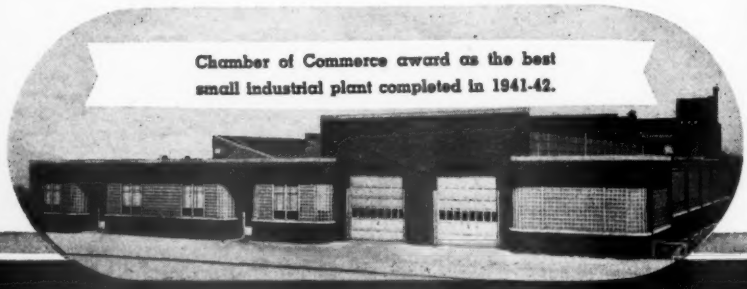
Bunell

WIDE RANGE OF FACILITIES

OUR facilities are particularly valuable to manufacturers because they include such a very wide range of sizes and types. Machine tools and accessories for producing tools, dies, jigs, fixtures and gages range from very small to generously large —limits of 15 to 20 tons. Precision parts facilities are similar.

Our "know-how" includes design, development and construction of tooling as well as complete production of parts and assemblies.

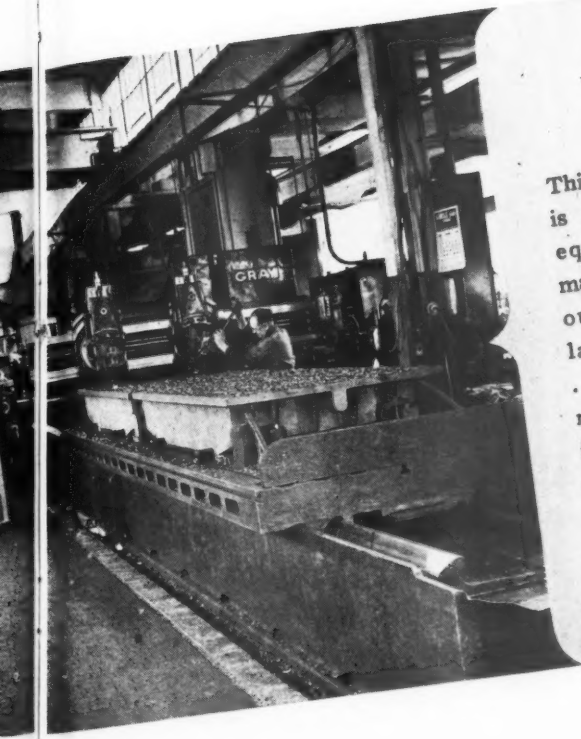
From time to time we have openings for early deliveries of both tools and parts. Your inquiries will be given courteous consideration.



Chamber of Commerce award as the best small industrial plant completed in 1941-42.

THE BUNELL MACHINE & TOOL COMPANY

1601 EAST 23RD STREET • TELEPHONE CHERRY 0343 • CLEVELAND 14, OHIO



★

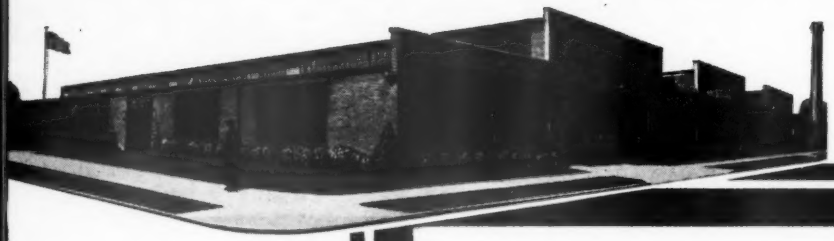
This large planer is one of many equally modern machine tools in our plant, both large and small . . . . . They are manned by genuinely skilled operators.

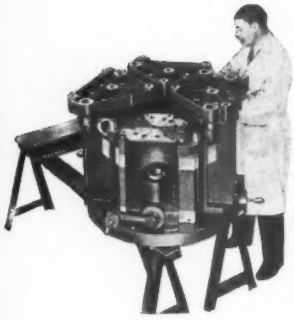
★

DESIGNERS AND MANUFACTURERS OF

Tools • Special Machinery • Dies • Jigs • Gauges • Fixtures

PRECISION PRODUCTION OF PARTS AND ASSEMBLIES





Large tools or small tools receive the same attention. There is only one standard of quality — the very highest.

Only the inex or that

YES, there is great variation in breeds of pigs and there is often a vast difference, too, in the way two tool shops handle identical assignments. The difference may be called a matter of detail but in production tooling, where results depend upon "*split thousandth accuracy*," expert engineering and exact execution of those designs assume importance that rarely exists elsewhere.

Typical of McKinney equipment is this jigborer, one of three similar machines.

CLEVELAND THE TOOL CENTER OF THE WORLD

The building of experimental models is also an exacting work in which McKinney craftsmen are highly proficient.

perienced say that "Pigs is Pigs"
TOOLS IS TOOLS

The McKinney reputation for sound judgment, absolute accuracy and consistent dependability has grown with the years. Today, many top production executives regularly send their most exacting work to the McKinney organization with confidence born of repeated satisfactory experiences.

Never have we been in as good a position as now to render broad, prompt and efficient service.

Our especially designed plant is equipped with the finest machine tools available which are rigidly maintained in condition to assure compliance with the exceptionally close tolerances demanded today.

Our large personnel is unexcelled in training, experience and attainments.

Write for our illustrated literature and test these statements with the next tooling job that comes up.

McKINNEY TOOL & MFG. CO.
CLEVELAND

DESIGNERS and BUILDERS of PRECISION TOOLING
Since 1920
1673 Arabella Road

Tools · Dies · Jigs · Fixtures · Special Machinery

ACCURACY YOU CAN TRUST

WOODWORTH

N. A. WOODWORTH CO., SALES DIVISION, 1300 E. NINE MILE ROAD · DETROIT 20, MICHIGAN

PRECISION GAGES · GROUND THREAD TAPS · FORM TOOLS · PRECISION MACHINED PARTS · HEAT TREATING · PLATING

ABRASIVE 3-B SURFACE GRINDER

CHROME STEEL SPINDLE HARDENED GROUND & LAPPED
ONE-SHOT LUBRICATION
FULL AUTOMATIC FEEDS
2 TABLE SPEEDS 20 AND 40 FT. PER MINUTE
ATTACHMENTS & ACCESSORIES FOR WET OR DRY GRINDING
CAPACITY
LONGITUDINAL 24
TRANSVERSE 8
VERTICAL 12
RIGID ONE-PIECE BED CASTING

TODAY this highly accurate and dependable surface grinding machine is serving the production needs in many war plants.

TOMORROW the accuracy, reliability and production capacity of the 3B grinder will be important factors in peacetime competition.

ABRASIVE MACHINE TOOL COMPANY

DEALERS IN PRINCIPAL CITIES

EAST PROVIDENCE 14, RHODE ISLAND

LIPPING FORM CUTTERS

BOOSTS SCREW MACHINE OUTPUT

SINGLE DUMORE GRINDER AIDS LARGE BATTERY TO OPERATE AT CAPACITY

When long chips tangle with spindles, the operator wastes his time to pull them away and less than capacity production prevents efficient machine loading. One large screw machine shop solved this problem simply by lipping their form cutters, to curl and break chips properly.

A Dumore Precision Grinder (bench mounted) proved to be the best tool for this lipping operation . . . another example of the remarkable Dumore versatility and the strikingly large return which so often comes from a small investment—if the investment is in a Dumore.

Get the full story of tool room and production operations performed economically with Dumore Precision by sending for Catalog 42 today! The Dumore Company, Tool Division, Department TC42, Racine, Wisconsin.

DUMORE

PRECISION AND OFF-HAND GRINDERS

DUMORE GRINDERS ARE SOLD BY AUTHORIZED DISTRIBUTORS IN ALL PRINCIPAL CITIES

THE FINEST LINE OF STANDARD CARBIDE TOOLS EVER OFFERED

The *new* New England line of *standard* carbide tools is the finest ever offered *at any price*. Points of superiority include black, rust-proof shanks as *standard* — quick color identification for "U" and "S" grade tips — a *mirror finish* is *standard* on all exposed carbide surfaces and cutting edges, for finer work finish — and at no increase in cost.

You cannot afford to miss these features when the best costs no more!

NEW ENGLAND

CARBIDE TOOL CO.

60 Brookline Street

Cambridge, Mass.

MAIL THE COUPON TODAY!

Please send me your new Standard tool folder and a Standard tool wall chart for our tool room.

NAME_____ TITLE_____

COMPANY_____

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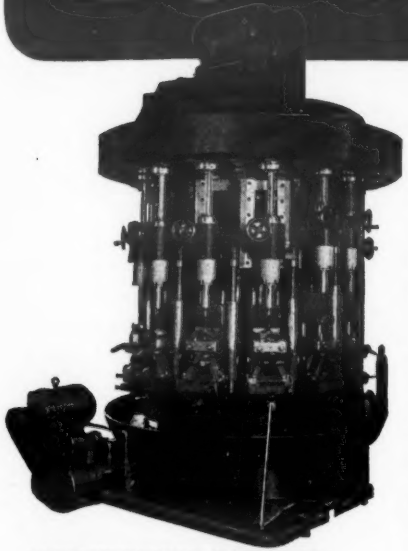
3 BIG PRODUCTION INCREASERS

Special Delivery FROM SOMMER & ADAMS

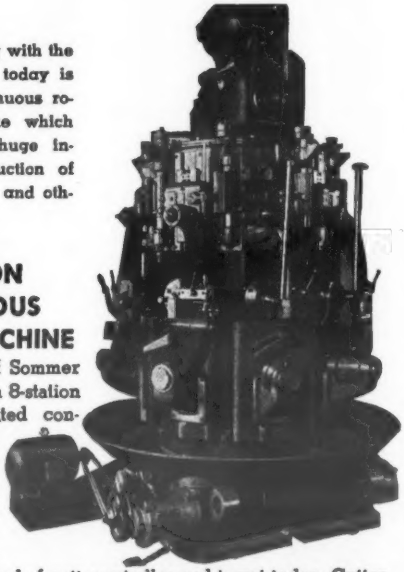


CONTINUOUS DRILLING WITH 12 SPINDLES

★ Here are three unusual machines which speak for The Sommer and Adams Company's 25-year acquaintance with the field of special machines. They were created in their entirety and built by our staff. Their remarkable production records are not to be publicized at this time. However, those records are sufficiently convincing to justify *your* confidence in the Sommer and Adams organization as a source of supply. Also, they should earn *your* inquiries for the design and construction of special-purpose equipment.

Altogether in keeping with the increasing tempo of today is this 12-spindle continuous rotary drilling machine which makes possible a huge increase in the production of automotive, airplane and other parts.

8-STATION CONTINUOUS MILLING MACHINE



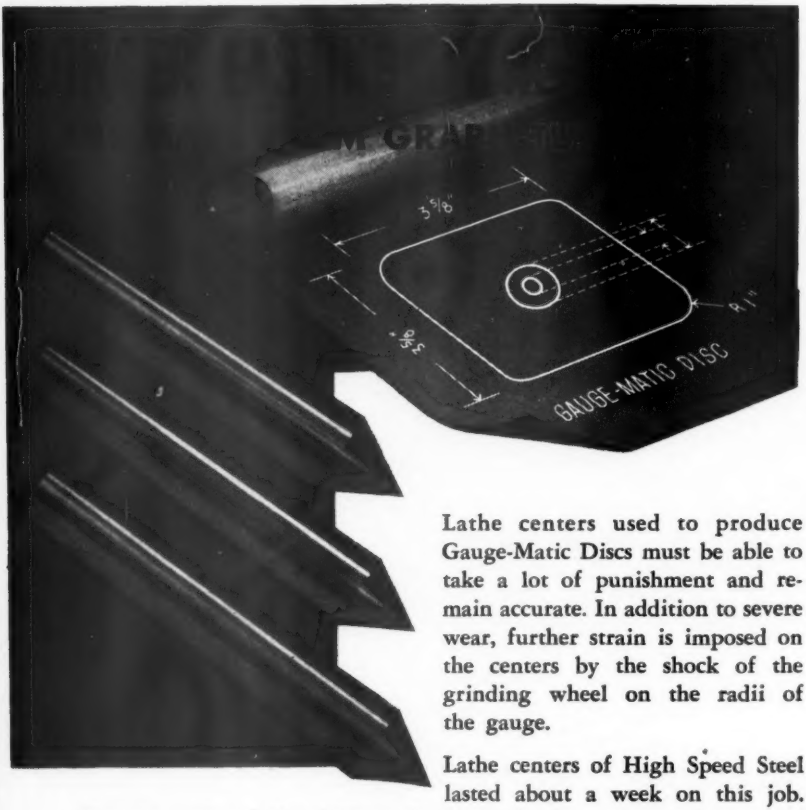
Another example of Sommer & Adams design: an 8-station mechanically operated continuous milling machine for milling keyways in axle shafts. Pick-off gears in index and spindle gear boxes change speed and feed of cutter spindles and turret index. Cutter spindles are worm-and-worm driven. All in all, a machine designed and built to answer today's insistent call for speed with accuracy.

8-SPINDLE ROTARY INDEXING DRILLING, REAMING, TAPPING MACHINE

Still another example of special design by Sommer and Adams to fill a special purpose—an 8-spindle machine, central column type, with multiple heads for drilling, tapping, countersinking and reaming holes in crankshaft flanges. Operation is entirely mechanical and electrical. Heat-treated drive gears, hardened and ground worms, and hard bronze worm gears suggest superior materials and workmanship. A machine that gives speed plus accuracy.

The Sommer & Adams Co. places at your command a 25-year acquaintance with the intricacies of special machine design and construction.

THE SOMMER & ADAMS COMPANY
18511 EUCLID AVENUE • CLEVELAND, OHIO
Custom-Built EQUIPMENT FOR MANY PURPOSES

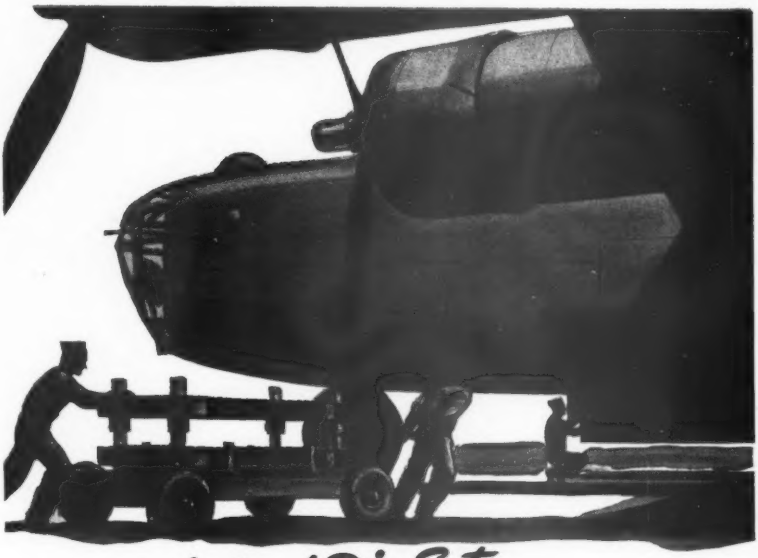


Lathe centers used to produce Gauge-Matic Discs must be able to take a lot of punishment and remain accurate. In addition to severe wear, further strain is imposed on the centers by the shock of the grinding wheel on the radii of the gauge.

Lathe centers of High Speed Steel lasted about a week on this job. Centers made of Graph-Tung Steel remained accurate and true and gave excellent performance 24 hours a day, seven days a week for 3 weeks! A total of 504 hours of uninterrupted, accurate, wear-resisting, service. A marvelous record, but typical of the job Graph-Tung Steel is doing wherever it is used.

Graph-Tung, a water hardening steel, has given excellent results when used for tools, dies, brake drums, cylinder liners, pump tubing, bushings, etc.

Today Graph-Tung and other Graphitic Steels, Graph-Mo, Graph-Sil, Graph-Al, Graph-M.N.S., are helping to hasten an early peace. Tomorrow they will be ready to speed production of your new products. Steel and Tube Division, The Timken Roller Bearing Company, Canton 6, Ohio.



They don't load Die Sets in BOMB BAYS

Die sets are work-a-day products that stay at home, holding and guiding the dies that stamp out and form plane parts by the millions. We can safely and proudly say that Danly Die Sets have speeded America's air program.

Danly facilities and service have been steadily increased since 1940. One of the major objectives was to be ready for the mass production of planes—that was sure to come—that came—planes that are blasting the way to winning the war.

If you need die sets in any phase of your production call Danly.

Call Danly:

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MILWAUKEE	Broadway 1644
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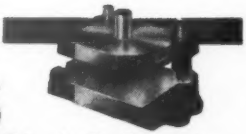
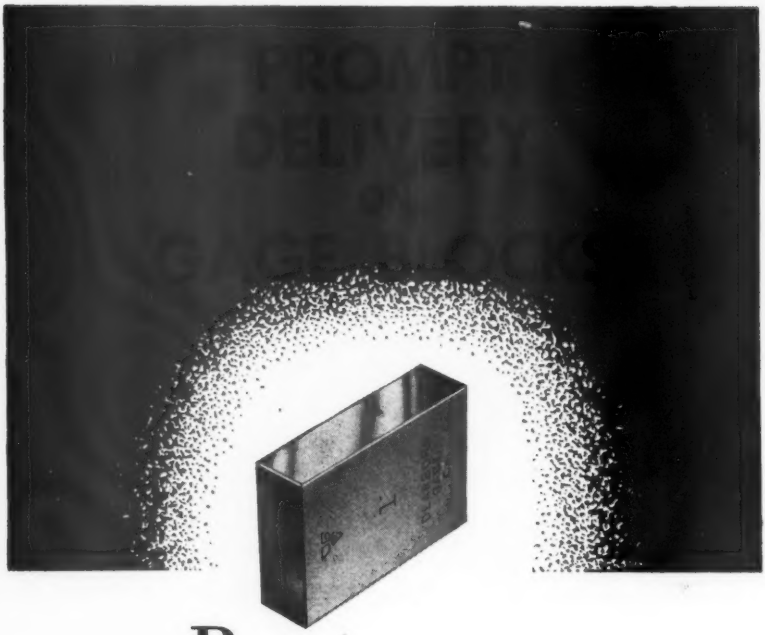


DANLY DIE SETS

Welded Steel Fabrication



PROMPT DELIVERY can now be made on most Dearborn Gage Block W or Working Sets. These gage sets have a guaranteed tolerance of ± .000008 inch or fraction thereof. Their gaging surfaces are all chromium plated (an exclusive feature) for longer wear. Wire your order today or contact your nearest Dearborn Distributor.

Or "Working Sets"
"W" accuracy is a guaranteed tolerance of ± .000008 inch per inch, or fraction thereof, of gage.

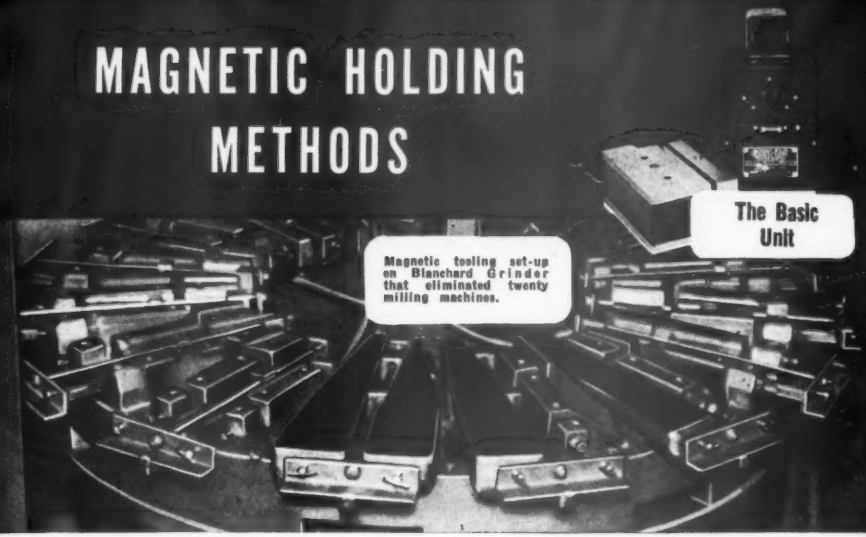
Or "Inspection Sets"
"I" accuracy is a guaranteed tolerance of ±.000004 inch per inch, or fraction thereof, of gage.

Or "Laboratory Sets"
"L" accuracy is a guaranteed tolerance of ± .000002 inch per inch, or fraction thereof, of gage.

DEARBORN GAGE CO. 22038 BEECH STREET DEARBORN, MICH.

Originators of Chromium Plated Gage Blocks

MAGNETIC HOLDING METHODS



New Holding Applications

Magnetic holding fixtures may be made and adapted so that work may be held magnetically, eliminating the necessity of clamping.

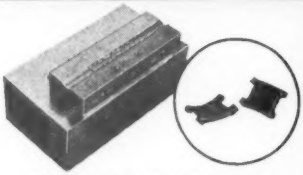
Even work that keeps the tool engineer sitting up nights to design a suitable fixture, may be easily and quickly handled with a magnetic holding adapter.

The tooling shown above required several of our basic units which were readily applied to the Blanchard Grinder. The method shown broke a bottleneck and also reduced the cost of machining the parts to less than one-fourth of former cost.

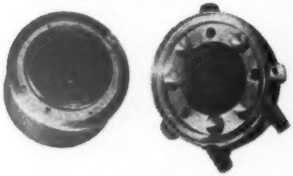
The use of magnetic adapters with our basic units offers wide possibilities for quick and inexpensive solutions for many of your holding problems. Difficult set-ups of either large or small work may be handled.

Are you overlooking the possibilities of magnetic holding fixtures?

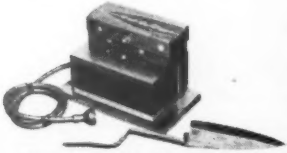
Send for "Magnetic Chucking Revolutionized"



Magnetic adaptor for holding concave brake shoes for form grinding. Work shown one-half actual size.



Custom built circular Magnetic Chuck to hold special work for lathes and grinders.



Sheep shear blade die adapted for magnetic holding; operation, hollow grinding blade.

MAGNETIC HOLDING DEVICES, INC.

2034
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OHIO

Longer running time between replacements

To make machines run longer before requiring attention to centers — choose the center with the helical groove — made only by CMD. The exclusive advanced design, with the left-hand Helical Groove, assures more complete and longer lasting lubrication of point and work. No more burned-out center points! No stopping machine to relubricate center! No readjustments of tail stock! When CMD Helical Groove Centers are lubricated with CMD Center Point Oil, running time is frequently increased as much as 1500 per cent.

Write for* FREE *Sample Kit

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Dept. 3J, 1828 West 46th St., Chicago 9, Ill.

Send circular on CMD Helical Groove Centers.

Without obligation to us, send FREE sample kit containing a tube of CMD CENTER POINT OIL and a tube of CMD CENTER POINT LUBE (grease) with directions for making an amazing, simple test.

NAME .....

FIRM NAME .....

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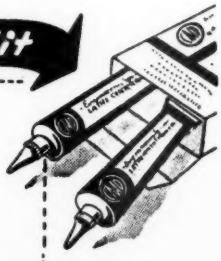
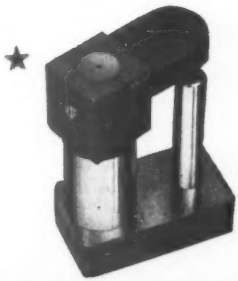


★ These TURNER gauges are helping to increase war production

Perhaps we can help you on some of your inspection problems by assisting you in designing special gauges. Quotations will be gladly submitted if accompanied by blue prints and complete specifications.



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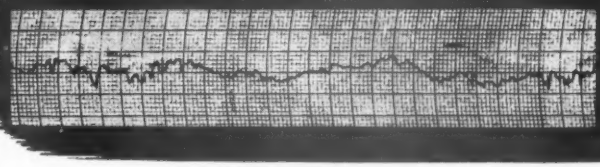


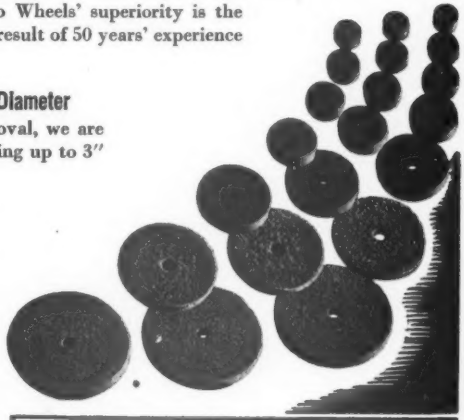
Surface Analyzer Tapes Show You Get A Better Finish With Chicago Wheels

These results were obtained at a rate of 10 pieces per hour in an aircraft parts plant. Material, X-13-15, Rockwell 60 to 57, grinds out .006 to .007 stock. Chicago Wheel used, ½ x ½ x ⅛", Grain 180, Grade L Arcite. Spindle Speed 40,000 r.p.m. Lapping and super finishing eliminated on this job.

Can you match that finish? Sounds phenomenal, but you can do the same thing with Chicago Wheels.

Squint your eye along the surface, test it by "feel" or be scientific and use a surface analyzer to measure your finish in micro inches — you'll find that Chicago Wheels give you better finishes, hold closer tolerances and have longer life. They're mighty fast, too; are often spoken of as "bottleneck busters."

One of the secrets behind Chicago Wheels' superiority is the exclusive bond formula developed, as a result of 50 years' experience making grinding wheels.



Now Featuring Wheels Up to 3" in Diameter

For the duration, with full WPB approval, we are specializing on the small sizes — anything up to 3" in diameter.

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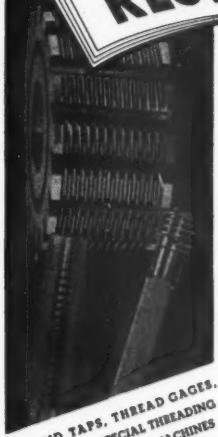
#8 for thread production



GROUND TAPS, THREAD GAGES, THREAD HOBS & SPECIAL THREADING TOOLS. SPECIAL TAPPING MACHINES

When tapping holes in costly machined parts, particularly bottoming holes where at times the material may run "tough" or have hard spots or where operators are less experienced, it is sometimes a good idea to cut a groove in your tap shanks so that the shank will break before the tap sticks and ruins the part. It will also ensure that your tap will break outside and not inside the hole for easier removal of the broken part.

"Detroit" taps themselves are tough and do not break easily. Most of the time that's an advantage. Once in a while it isn't and you might wish that they weren't quite so good as they are. Sometimes you *want* to break a tap.

BUY U.S. BONDS STAMPS

DETROIT TAP & TOOL CO.

8432 BUTLER
DETROIT, 11
MICH. U.S.A.

The Collet that "Makes" Precision

Collapses 1/32 in. — Retains Gripping Strength and Accuracy.

Collet open at both ends.

PRINCIPLE

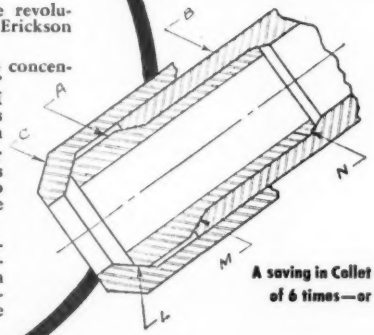
The drawing (right) illustrates the revolutionary principles embodied in the Erickson Precision Collet Chuck.

Collet "A" is automatically lined up concentrically with the axis of the Shank "B" by two Cam Surfaces of the Collet "M and N" mating with the Cam Surfaces of Shank. The Shank and Collet Cam Surfaces are mated to within .0001 inch.

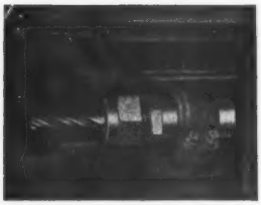
This action aligns Collet with the Axis at the Center of Shank, allowing it to be drawn back by Collet Cam Surface "L" and Nose Piece "C".

Due to the fact that collet is open slotted at both ends, Collet "A" then collapses equally throughout its length to maintain a vise-like grip and remain in perfect alignment with the Axis of Shank.

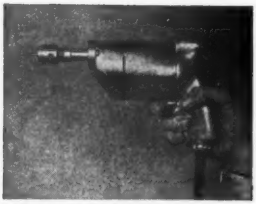
One ERICKSON COLLET will replace 7 standard, single purpose Collets.



A saving in Collet expense of 6 times—or more.



Model 402 Chuck in use on Automatic Screw Machine. Drill gripped on flutes.



Special Model 202 Chuck used in Hand Drills in Aircraft Industry. 01 Models are regularly recommended for Hand and Air Drills.

Model 201 used in drill press. Extra long drills can be used, by extending them from the chuck as they wear.

Send for Bulletin E giving complete information and additional photographs of uses

ERICKSON STEEL COMPANY

The ERICKSON COLLET CHUCK★★

Model "01" accurate within .0005 or less at the nose.

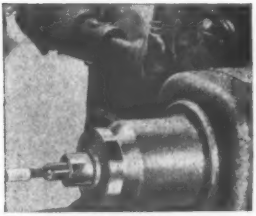
Models 102 and 402 Chucks in use on Automatic Screw Machine.

Horizontal Miller with 102 Chuck used to hold Woodruff Key Cutter.

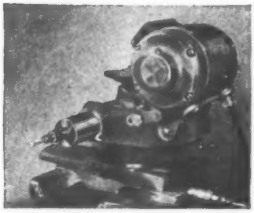
Model 102 Chucks for drilling and tapping operations on Turret Lathe. Jobbers Drill stubbed on chuck in foreground.

Model "02" accurate within .001 or less at the nose.

Main and auxiliary turrets equipped with Erickson Chucks. Note short drill overhang, taps and reamers.



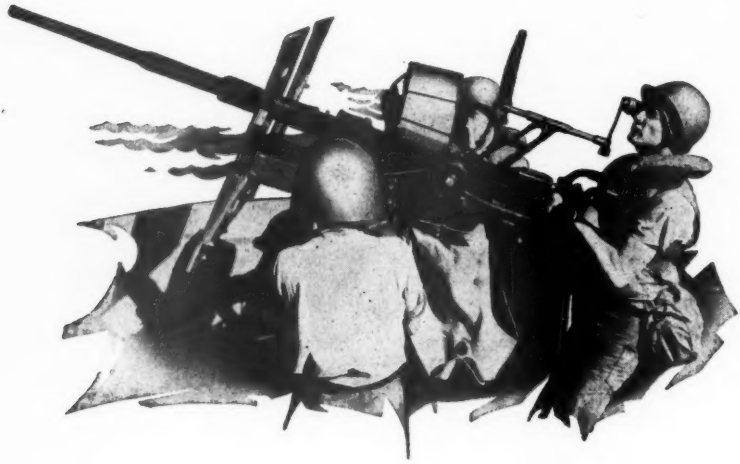
Model 301 Chuck designed for high speed internal grinding operations.



Tool Post Grinder equipped with Model 301 Chuck.

Dept. A, 2309 Hamilton Ave. **CLEVELAND 14, OHIO**

Accuracy is their Job . . .



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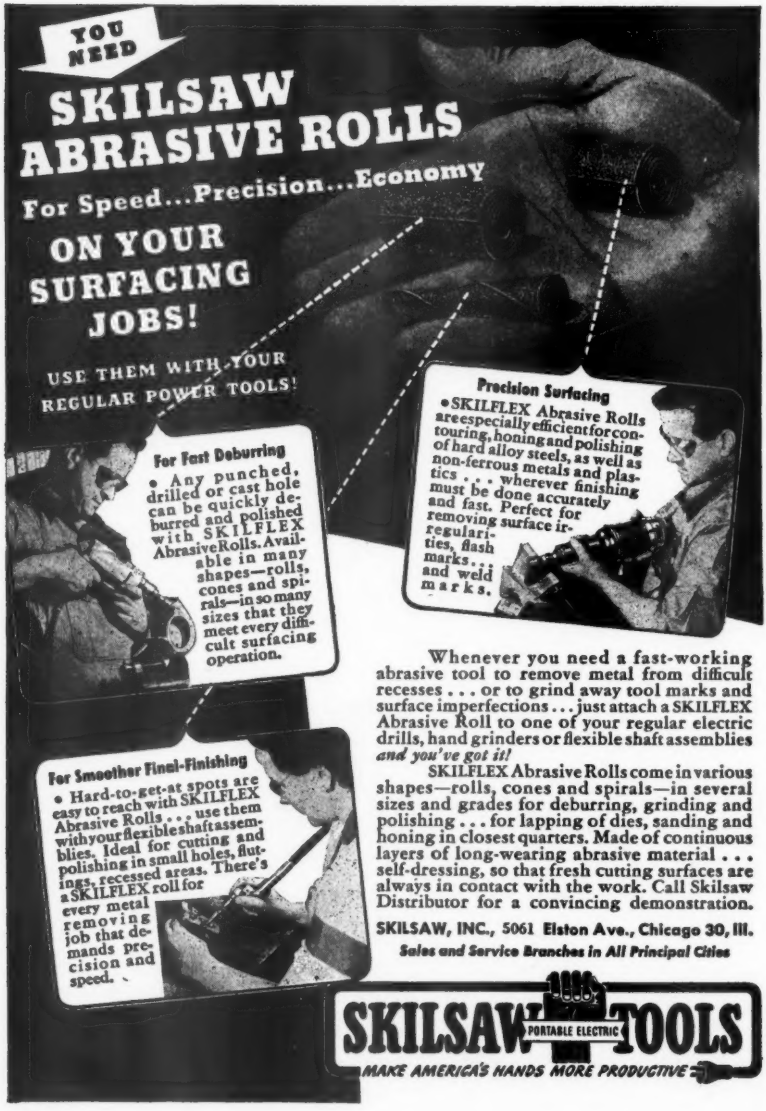

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Whenever you need a fast-working abrasive tool to remove metal from difficult recesses . . . or to grind away tool marks and surface imperfections . . . just attach a SKILFLEX Abrasive Roll to one of your regular electric drills, hand grinders or flexible shaft assemblies *and you've got it!*

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and other machines requiring selective speeds. 1 to 25 hp.

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REPRESENTATION IN MOST PRINCIPAL CITIES
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STEEL COMPANY

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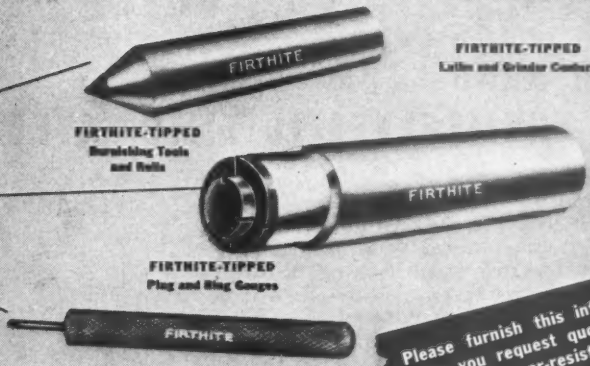
Makers of High-Speed Steels, Tool and Die Steels, and Sintered Carbides

...if your work, machines, or equipment involves ABRASION



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Costly tool room time is saved when you use Boyar-Schultz Copper Head Laps. They are also fast working . . . a double saving. Copper Head Laps never wear out; sleeve adjustment feature permits maintaining correct lapping size till worn out when it is replaced with a new sleeve. Available from Stock in standard sizes, 1/8" to 2 1/2".

BOYAR-SCHULTZ SMB MACHINE BOLTS

SAVE the Machine • SAVE the Job • SAVE Time

Heat treated alloy steels make them T O U G H for heavy work; machined heads and carefully cut threads make them A C C U R A T E for the most exacting tool room work. Heads are machined square with bodies, presenting a clean, flat surface to the T-Slot. Work is held tightly under heavy machine cuts. Close adjustments are possible.

Avoid worn or poorly made bolts. They can cause costly damage to machine beds, ruining the machine's accuracy.

For best results, use SMB Nuts and Washers. They are specially made for use with SMB Bolts.

BOYAR-SCHULTZ CORPORATION

2112 Walnut Street **CHICAGO 12, ILLINOIS**

DIE SPRING* FAILURE CAN BE CHECKED

* and other types of springs as well!

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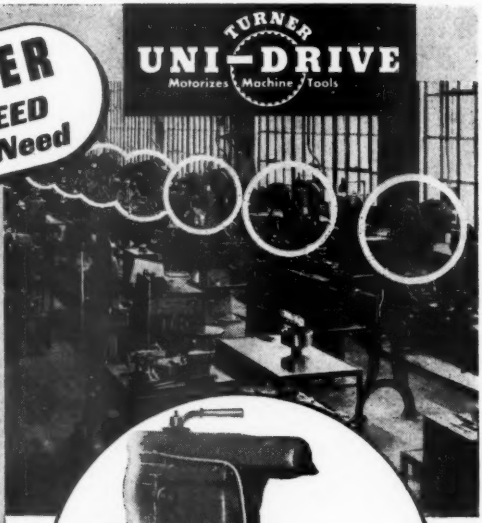

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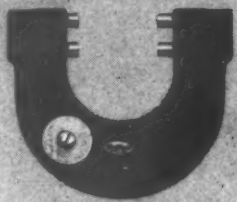
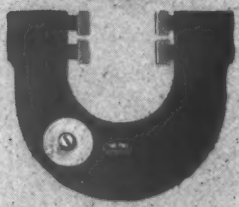
SHEFFIELD SNAP GAGE STAND

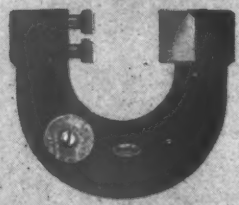
AGD MODEL 2MC



AGD MODEL A



AGD MODEL 2B



AGD MODEL 2C

THE SHEFFIELD CORPORATION

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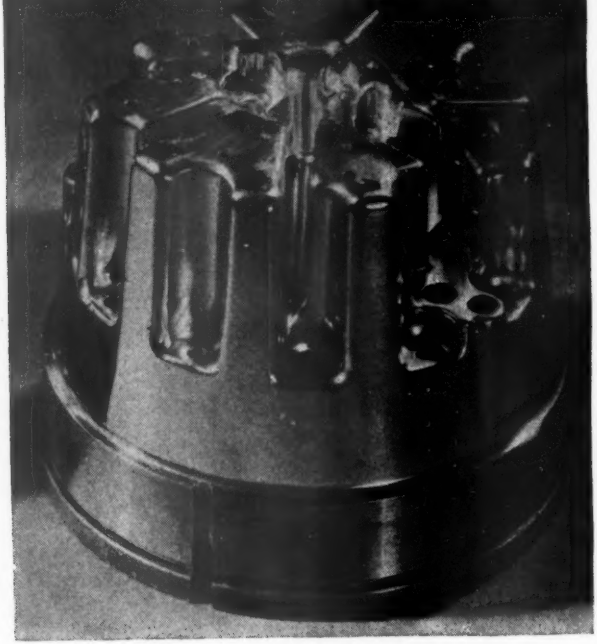
MACHINE TOOLS — GAGES — MEASURING INSTRUMENTS — CONTRACT SERVICES

SHEFFIELD MASTER CRAFTSMEN

TOUGH

BUT NOT ROUGH!



The highly complicated mold for the inside of an airplane ignition head, successfully plated at Hartford Chrome.

Tough but not rough, *chrome plated* molds resist corrosion, yield free extraction, keep production flowing smoothly! These solid advantages of hard chrome plating apply to an almost endless list of tools, dies and other parts. *Write For Free "Show-How" Literature*

Prompt Service!
With enlarged facilities, we can serve you promptly on production jobs, salvaging parts, or any hard chrome plate requirement. Map shows area we serve.

HARTFORD CHROME CORPORATION
525 PARK STREET • PHONE 2-6868
HARTFORD 6, CONNECTICUT
Licensed by United Chromium

For successful steel milling with carbides

- USE NEGATIVE RAKE
- INCORPORATE HEAVY BODY DESIGNS
- FINISH-GRIND EDGES WITH

DI-MET DIAMOND WHEELS

CUTTER engineers and carbide manufacturers are constantly improving carbide milling cutter designs for milling of steel and other metals. All approve of finish-grinding carbides with diamond wheels to obtain the finest, sharpest cutting edges! It's important—because diamond finished edges are smoother—make for longer cutter life, better surface finishes, lower power consumption—save wear and tear on both cutters and machines and cut much faster than ordinary abrasives.

DI-MET resinoid bonded diamond wheels are made in diamond grit sizes and concentrations for all carbide grinding applications and in types for reaching intricate shapes on cutting tools, for cylindrical grinding or plunge cutting on dies, and wherever carbides are used. They're fast, long lived, economical. Types, sizes, specifications and prices of DI-MET wheels are covered in our new catalog. Write for your free copy.

FELKER DI-MET
ARMY-E-NAVY

FELKER MANUFACTURING CO.
1111 BORDER AVE., TORRANCE, CALIF.

MANUFACTURERS OF DIAMOND ABRASIVE WHEELS

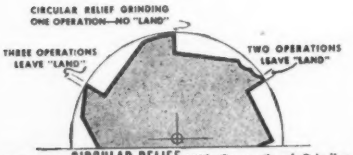
Get 3 to 5 times MORE WEAR per Grind!

CIRCULAR RELIEF GRINDING LEAVES NO "LAND"...GIVES YOU LONGER-LASTING EDGES

Why? Because each regrind is *better* than the conventional or "factory" grind. Not only do you receive more wear per grind, but the total OUTPUT per tool is increased many times. Tool replacement savings alone quickly pay for the machine.

Regardless of OUTSIDE CONTOUR, any kind of reamer or tap, including BENT SHANK TAPS of any size, can be ground faster and more accurately than by hand.

For further details on this revolutionary new grinder send the coupon TODAY.



Comparing CIRCULAR RELIEF With Conventional Grinding

Note from diagram how CIRCULAR RELIEF GRINDING *follows the curve* of the tool, grinds right up to the cutting edge, and does not cut away valuable metal supporting the cutting edge.

ONE MACHINE...ONE SET-UP ...ONE OPERATION does the entire grinding job QUICKLY and ACCURATELY

Send this Coupon

THE CLEVELAND
TOOL ENGINEERING CO.
1261 West 4th Street, Cleveland 13, Ohio

Send me illustrated circular giving full information about Circular Relief Grinder.

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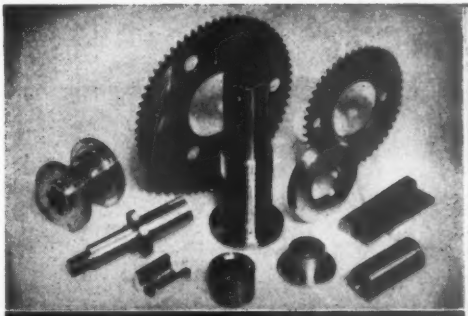
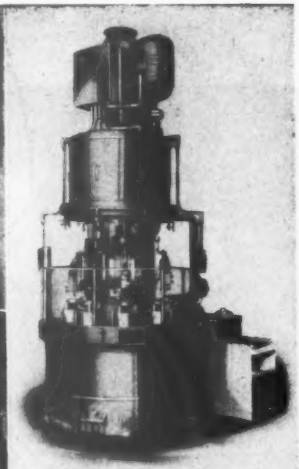


Leading machine-tool builders protect you against failure at critical points . . .



Ampco Metal Parts in the Bullard Mult-Au-Matic

Bullard machines, built by The Bullard Company of Bridgeport, Connecticut, include over 60 different parts of Ampco Metal — a mark of progressive engineering.

— with parts of wear-resisting Ampco Metal

Check for this protection, when you look at the specifications of machines you buy — for you know that the name "Ampco" stands for longer life, several times that of ordinary bronzes. This remarkable alloy of the aluminum bronze class has been adopted by over 90 leading machine-tool makers — where they need exceptional strength, hardness, or resistance to wear, shock, and fatigue. Be sure you get it on new machines — replace worn parts of your older machines with durable Ampco. Write for catalog.

Ampco Metal, Inc.

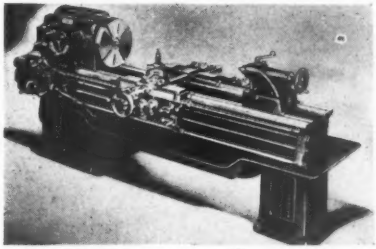
Department TD-3 Milwaukee 4, Wisconsin

Reg. U. S. Pat. Off.

AMPCO

Metal

The Metal without an Equal



For replacements

Ask the nearest Ampco field engineer to study your maintenance requirements and suggest an Ampco Metal stock list to meet the specific needs of your Maintenance Department.

Sidney 16-speed model heavy-duty engine lathe. Headstock equipped with center bearings and 14 gear bushings of Ampco Metal.

[Tear out and mail coupon today!]

AMPCO METAL, INC.
Dept. TD-3 Milwaukee 4, Wis.

Please send

☐ File 41—Engineering Data Sheets
☐ Information on Maintenance Uses

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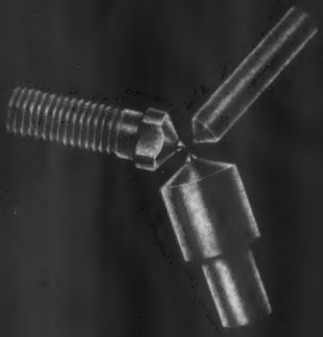

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Processed for Service
Built with Quality

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MACHINING *Ceramics* IS NO PROBLEM

WHEN YOU USE WALKER-TURNER MACHINE TOOLS

Cutting a coil form on a Walker-Turner Radial Saw, equipped with a special attachment for rotating the workpiece.

One of several groups of Walker-Turner Drill Presses in the General Ceramics plant. These machines are used in drilling and tapping insulators of all types.

At General Ceramics and Steatite Corporation's plant, Walker-Turner Machine Tools are used on a variety of jobs — in machining the Steatite insulators which this Company manufactures for the High Frequency Communication Equipment used by our Armed Forces.

Walker-Turner Machine Tools *wide range of speeds* enables General Ceramics to select the optimum speed for their particular work. Their *accuracy* and *spindle stability* are important because Steatite is machined in its green, fragile condition before firing. And their *simplified design* and *easy operation* help this Company's many women workers turn out a greater volume of high-quality work.

In thousands of other war plants, also, Walker-Turner Machine Tools are doing a notable job in getting production "over the hump". Perhaps they are the answer to some of your machining problems, too. Send for catalog.

WALKER-TURNER COMPANY, INC.
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MACHINE TOOLS

DRILL PRESSES — HAND AND POWER FEED • RADIAL DRILLS
METAL-CUTTING BAND SAWS • POLISHING LATHES • FLEXIBLE SHAFT MACHINES
RADIAL CUT-OFF MACHINES FOR METAL • MOTORS • BELT & DISC SURFACERS

1

WEAPONS OF WAR

Called the "most indispensable unit of any fleet," the destroyer is an interceptor of the sea—a bantam battler worth her salt in any encounter.

Speedy, spunky, hard-riding and bristling with power, destroyers pack a potent wallop and their versatility is the pride of the fleet.

Turchan all hydraulic Followers are being put to good use by many of those who are producing American destroyers and other weapons of war. The mass production of such weapons would be virtually impossible if every single odd shaped part had to be painstakingly produced under direct machining methods. By means of Turchan all hydraulic duplication such parts are turned out from three to twenty times faster. Turchans attach easily to any standard lathe, planer, shaper, grinder or mill. And they are extremely simple to operate. Inquire today.

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Originators of Hydraulic Duplicating Attachments

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where Quality Counts

From selection of steel to the final rigid inspection every step in the Barnes production process has quality as its aim. This is the reason discriminating buyers make a point of specifying Barnes band saws and hack saw blades — made by blade specialists, for metal cutting exclusively. Order from your Mill Supply Distributor.

The W. O. Barnes Company is glad to co-operate with the War Production Board in promoting tool conservation. Barnes factory trained service men are available in helping to solve blade problems.

W. O. BARNES CO. INC.
DETROIT MICHIGAN

SPEED UP PRODUCTION

WITH

SOUTH BEND LATHES

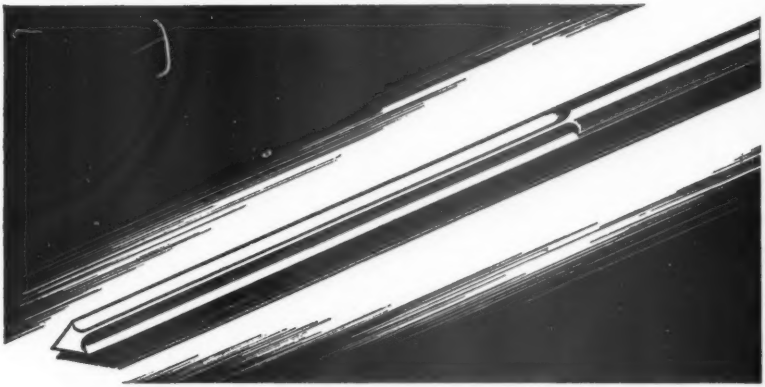
Time saved on production speeds the delivery of vital matériel to our fighting forces. Now, on the home front, it is a fight to the finish for maximum production.

South Bend Lathes can help you speed up production on toolroom and manufacturing operations. They have dependable precision, a wide range of speeds and feeds, and the strength and rigidity for effective use of tungsten carbide tools. Their ease of operation also contributes to their efficiency.

South Bend Engine Lathes and Toolroom Lathes are made in five sizes ranging from 9″ to 16″ swings, with bed lengths from 3′ to 12′. The Turret Lathes have 9″ and 10″ swings. Catalog 100C will be mailed upon request. *South Bend Lathe Works, South Bend 22, Indiana, Lathe Builders for 37 Years.*

★ BUY WAR BONDS ★

16″ swing, South Bend Toolroom Lathe



2000 HOLES PER REAMER —Instead of only seven!

Here is a war-production fact that sounds fantastic—yet its truth brings striking evidence of the superior performance of L & I Ground Flute Reamers, when they replace ordinary milled flute reamers.

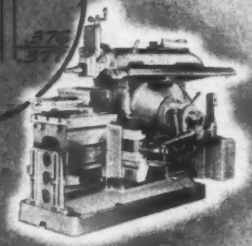
The Oilgear Company of Milwaukee reports that with milled flute reamers they were usually unable to complete with one reamer the seven holes required in an important piece. They are now using L & I Ground Flute Reamers and are producing an average of nearly 2000 holes per reamer.

If you haven't tested the keener cutting edge and longer life of L & I Ground Flute Reamers against the ordinary milled flute reamers you are now using, why not send us a trial order—or write for literature?

L&I GROUND FLUTE REAMERS

LAVALLEE & IDE, INC. CHICOPEE, MASS.

KEY WAYS
...the right way!



. . . . Internal shaping is another function of the Shaper requiring accurate performance. Here a Cincinnati Shaper holds close tolerances cutting Kennedy Key Ways in an eccentric.

Write for Catalog N-2

THE CINCINNATI SHAPER CO.

CINCINNATI OHIO U.S.A.

SHAPERS · SHEARS · BRAKES

SHELDON

"Keeping 'em Rolling"

Wherever our Armies go, SHELDON LATHES move with them for they are basic equipment in the Army's Mobile Machine Shops and Mobilized Instrument Repair Shops.* These compact truck-mounted machine shops are found wherever the going is toughest for it is their job to keep all mechanized ordnance operating efficiently. It's a big assignment, and we are proud that SHELDON Precision Lathes are selected to handle it.

*SHELDON Lathes are also standard in the Marine Corps Mobile Shop Trailers and on many Naval Craft.

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SHELDON MACHINE CO., Inc.

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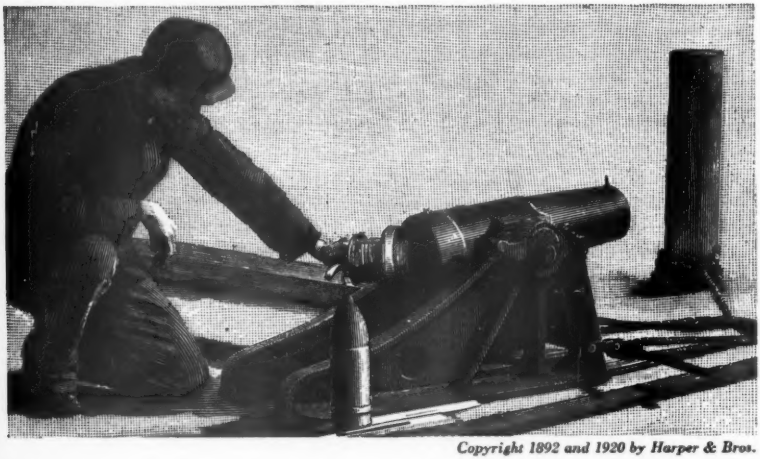
"This is a Grinding War . . ."



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MORTAR'S GRANDPA

You could pick up this U. S. mortar about as easily as you could move a safe and it was about as easy to move around. But its advocates back in the nineties foresaw the importance of such armament in modern warfare.

Today's version can be carried at a brisk trot by a couple of men. It can go into action in seconds. It's a precision weapon—precision built, facts that many a Nazi and Jap have discovered with a jolt.

Where did a lot of the modern mortar's precision come from? From a little iron-bowl furnace in which over 52 years ago, Dr. Edward Goodrich Acheson created the first man-made abrasive. Since then abrasive products have become one of our most important production tools in the skilled hands of American industry.

Abrasive wheels are used to grind the parts of mortars, plane and tank engines, giant guns and other war weapons to unbelievable accuracy.

This accuracy is responsible not only for the efficient performance of these weapons—it also makes their mass production possible.

For mass production depends on interchangeability of parts. And interchangeability depends on split-hair precision.

Today it is almost impossible to put your finger on a single article mass produced for war or for peace that isn't in some way touched by grinding. On the land, in the air, on and under the sea, material produced by abrasive manufacturing methods are blasting the path to victory for the United Nations.

We of Carborundum are mindful that "this is a grinding war." Our efforts and resources are pledged to making it as short as possible.

THE CARBORUNDUM COMPANY, NIAGARA FALLS, N. Y.

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NEW FOR ASSEMBLY FIXTURES—

MASONITE* DIE STOCK

• *Masonite Die Stock used in an assembly jig for a wing flap at Curtiss-Wright Corporation*

MANY aircraft manufacturers today are using Masonite Die Stock in assembly fixtures where it will permit the reduction of the size of steel members.

There are three mighty good reasons why—this amazing, semi-plastic material cuts *weight, time* and *costs.*

Possessing inert qualities similar to metals—yet only one-sixth the weight of steel—Masonite Die Stock helps solve problems relating to rigidity, torque, deflection, expansion and retraction. And this smooth, durable material can be worked with either metal-working and cutting tools or with high-speed pattern shop equipment.

While its big success story is found in today's spectacular aircraft production, this modern die stock is also helping other fabricators of thin-gauge metals do a *faster, better job at less cost and effort.*

Masonite Die Stock is available in thicknesses of ¼ to 2 inches . . . in sizes of 48 x 72 inches and 48 x 144 inches. For more details, mail coupon below.

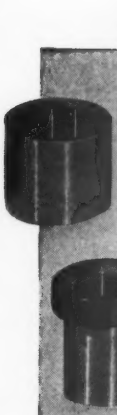
*TRADE-MARK REG. U. S. PAT. OFF. "MASONITE" IDENTIFIES ALL PRODUCTS MARKETED BY MASONITE CORPORATION. COPYRIGHT 1944, MASONITE CORP.

MASONITE CORPORATION
Dept. TJ-3, 111 W. Washington St., Chicago 2, Ill.
Please send me illustrative literature and complete information about Masonite Die Stock.

*Name and firm*_____

*Address*_____

*City*_____ *State*_____



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Bushings
by EX-CELL-O
...for 25 years
a leader
in precision
manufacture

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EX-CELL-O *for* PRECISION

EX-CELL-O CORPORATION
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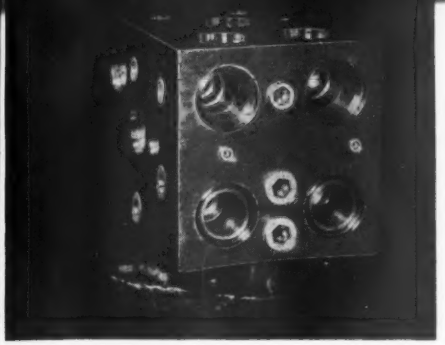
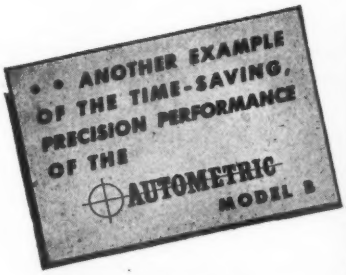
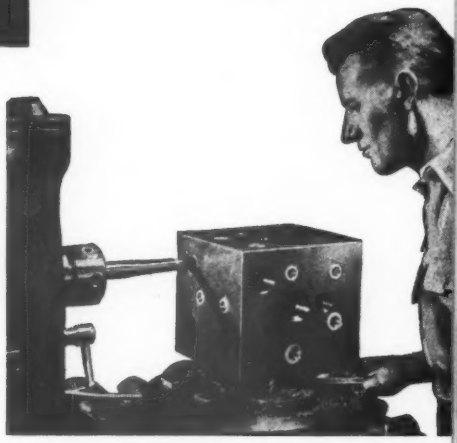


BORING 8 MULTIPLE DIAMETER HOLES

— at one setting — with 30% SAVING IN TIME



(Photos and performance data courtesy of C. B. COTTRELL & SONS CO.)
Milwaukee, Wisconsin



Take a good look at the work-piece shown above – centrifugally-cast steel unit requiring the precision b ing of a total of 8 holes — 5 of them with mult diameters and 3 holes (2 with 1½ inch diameters, 1 w 1¾ inch diameter; 7½ inches long) which must be h to within .0002 on the diameter throughout the entire de

Sure, it's a tricky job but a "natural" for the Autome Model B Precision Jig-Boring Machine. The piece rough drilled before being brought to the Autome where it was finish bored to specifications — at one ting — with a 30% saving in time over other meth

Such fast, precision performance is possible on the A metric Model B because it is the only jig-borer, wit built-in rotary table, capable of boring holes on all s of a work-piece *at one setting.*

Write for complete information on the Autometric Model B Jig-Boring Machine.

Rotary Head Milling Machine
Autometric Jig Borers
Center Scope

Kearney & Trecker
Products
CORPORATION
Milwaukee, Wisconsin
Subsidiary of Kearney & Trecker Corporation

Milwaukee Face Mill Grinder
Milwaukee Midgetmill
Milwaukee Speedmill

THE VITAL TENTH

One ten-thousandth of an inch is a minute unit of measurement, —so small that it seems insignificant to the average layman. And it isn't essential in the fitting of a drive of a locomotive.

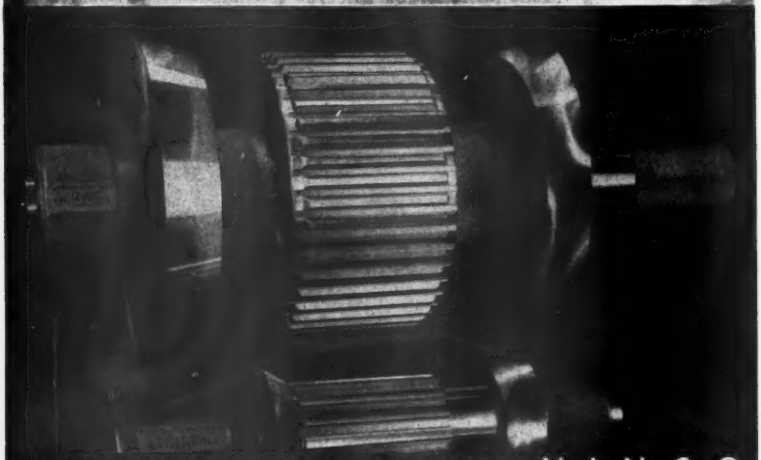
But it is most important to the boys who service or fly the high-powered airplanes of today—the fighters and bombers that are doing such a tremendous job of breaking the back of the Axis—these boys know how vital that last ten-thousandth of an inch can be. For example, it permits an almost invisible sloppiness or play in the fitting of a propeller to the splines of the drive shaft and this play, with the great power of the engine behind it, can cause serious vibrations which shorten the life of the entire plane by hours.

In the midst of a dog-fight or a bombing mission over Berlin or Rabaul, vibrations of this type, however small, can cost the lives of our fliers and the loss of our planes.

Vinco is one of the few precision gage makers who can produce checking gages and balancing arbors which are satisfactory to the aviation industry. The "vital tenth" is carefully controlled through every operation in the making of these gages.

Vinco's reputation in the making of precision gages has been honestly won during the past quarter century and today, top quality precision gages and Vinco are synonymous. Write for literature.

VINCO CORPORATION, 8855 SCHAEFER HIGH'Y, DETROIT 27, MICH.
SALES OFFICES: NEW YORK AND CHICAGO



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Semi-Automatic Hydraulic Spline and Gear Grinder • Optical Master Inspection Dividing Head • Involute Checker • Angle Tangent to Radius Dresser • Index Plates • Precision Vises • Sine Bars • Straight-side Spline, Serration Spline, Involute Spline and Helical Spline Plug and Ring Gages • Thread Plugs, Rings and Setting Plug Gages • Spur and Helical Master Gears • Munition Gages • Propeller Hub Gages • Built-up and Special Gages • Gear Rolling Fixtures • Spline and Index Fixtures • Hydraulic Power Control Utilization and Distribution Units • Engineering, Design and Development

From Parts Prints to Press in 8 Weeks

— No small task in these days of priorities, delays and last minute changes. Barth of Cleveland gives high credit to

"HARDSTEEL" DRILLS

which enabled them, on the signal equipment dies illustrated, to save many man hours and to keep an important delivery date.

With a "HARDSTEEL" Drill in an ordinary drill press and following simple instructions regarding speed and pressure, any mechanic can easily drill clean holes through steel hardened by any process—40 Rockwell "C" or harder.

A time saver when last minute emergency changes come through on hardened dies and parts. And the only way to assure matching of hardened parts at assembly—drill after hardening.

Used throughout industry for parts recovery and for production work—made in all sizes ⅛" to 1".

BLACK DRILL CO. *1400 East 222nd St. Cleveland 17, Ohio*

"YOU HARDEN IT . . . WE'LL DRILL IT"
with HARDSTEEL

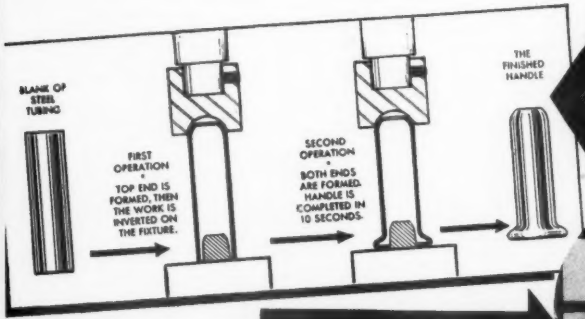
Complete information and practical operating suggestions in the 'HARDSTEEL' Operating Manual. *Copy free on request.*

"HARDSTEEL"

DRILLS · REAMERS · TOOL BITS · SPECIAL TOOLS

KRW HYDRAULIC PRESSES

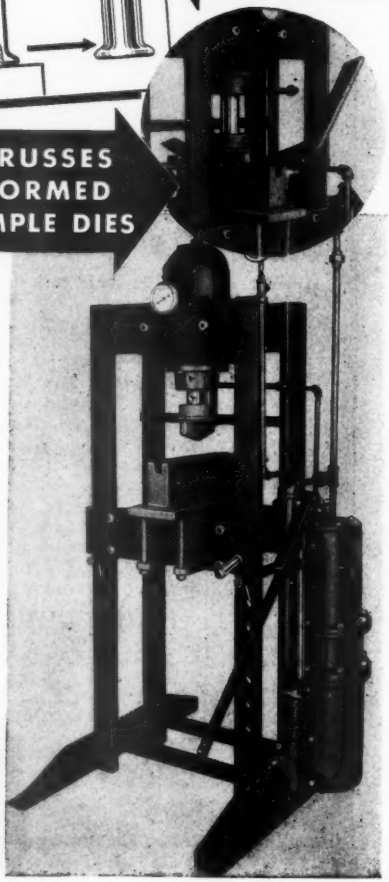
SPEED-UP MANUFACTURING OPERATIONS


BLANK OF STEEL TUBING
FIRST OPERATION
TOP END IS FORMED, THEN THE WORK IS INVERTED ON THE FIXTURE.
SECOND OPERATION
BOTH ENDS ARE FORMED. HANDLE IS COMPLETED IN 10 SECONDS.
THE FINISHED HANDLE

HANDLE GRIPS FORMED IN 10 SECONDS

Both of these jobs are formed on the Special 50-ton KRW Press illustrated lower right. Ram is raised and lowered by an Air Booster which operates the hydraulic oil pump. Press can also be operated manually with the long hand lever.

STEEL TRUSSES COLD FORMED WITH SIMPLE DIES



● **Many bending, straightening, flattening, offsetting, assembling and other operations can be performed on KRW Standard and Special Presses by the use of simple, inexpensive dies. The two examples given here are actual manufacturing procedure in our own plant. Press trusses are cold bent from a bar of SAE 1035 steel, 1" x 1¼", which is bent edgewise.**

KRW Hydraulic Arbor Presses provide the ultimate in *speed* and incorporate many exclusive features which particularly adapt them to many manufacturing operations. Standard Presses are made in 25, 50, 60 and 75-ton capacities. Special Presses, providing KRW advantages, can be designed to order. Write for our Press bulletin or for engineering assistance on any special problem.

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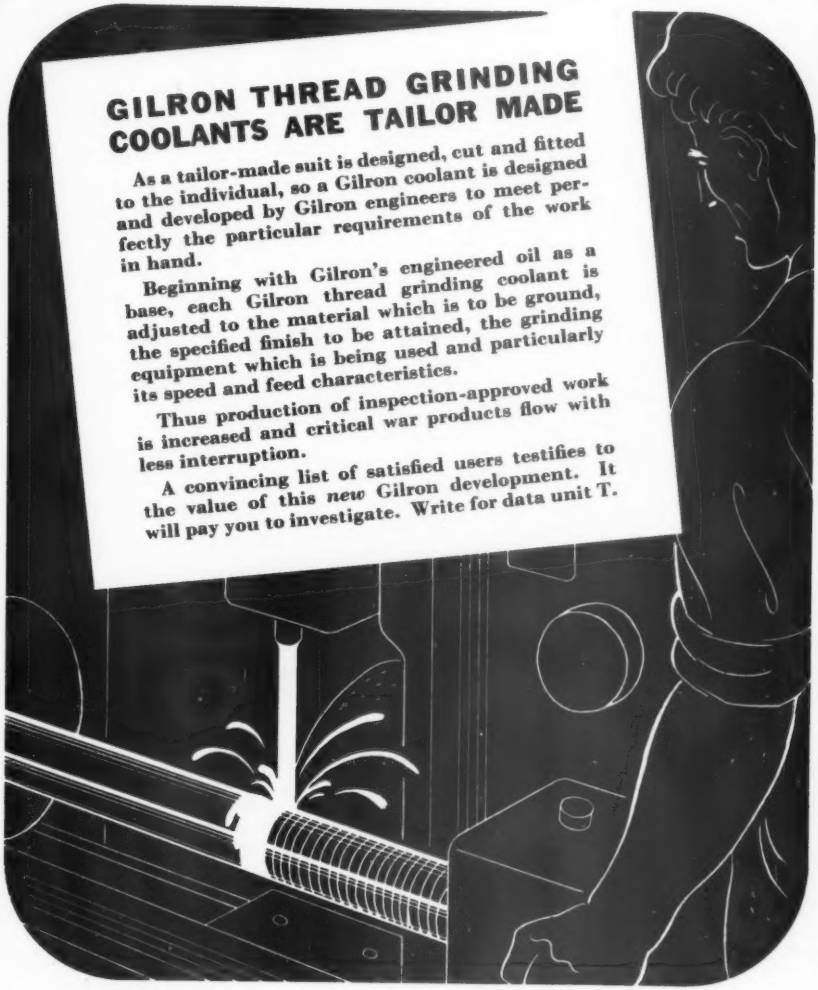

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Beginning with Gilron's engineered oil as a base, each Gilron thread grinding coolant is adjusted to the material which is to be ground, the specified finish to be attained, the grinding equipment which is being used and particularly its speed and feed characteristics.

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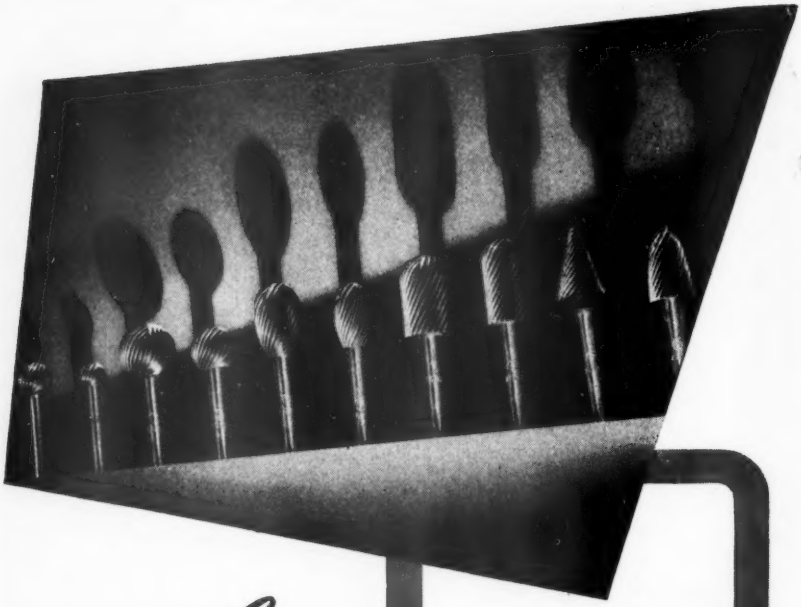
DRAWING-GRINDING-CUTTING



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Fifty to one—that's the performance you'll get from Ford Carbide Cutters over those of ordinary high speed steel. It's the *Quality* tool—harder biting, faster cutting, longer lasting—keeps production at its peak. Available in 20 sizes and 7 shapes. Write today for complete details from FORD, on carbide, the Aristocrat of Files.

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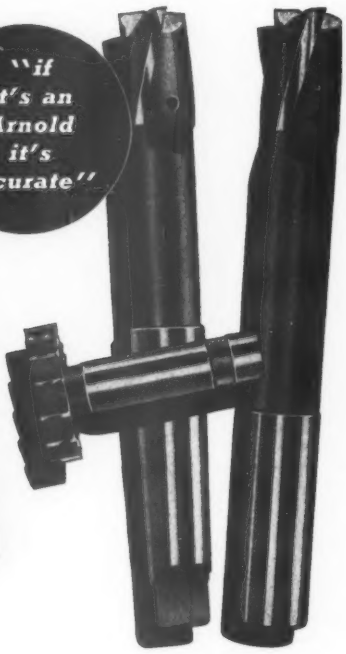

Many of America's leading manufacturers have learned that most of the quality cutting tools listed in the new Arnold catalog can reach them surprisingly fast. For instance, three types on which you can expect almost immediate delivery are illustrated above. They are: counterbores, straight and taper shank with interchangeable pilots and Woodruff key seat cutters. Arnold's thirty years of toolmaking experience can provide you with cutting tools that can be depended upon for maximum efficiency, service and accuracy. If you do not have our new 40 page catalog containing the complete Arnold line, send for it at once. No obligation.

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. . . AND INCREASE PRODUCTION SPEED

The Oil-Hole Drill effects a big saving in drilling costs for three reasons:

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THIRD, because it speeds up deep-drilling tremendously, thereby reducing production costs.

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Manufacturers of

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Circularity Relieved Reamers and End Mills
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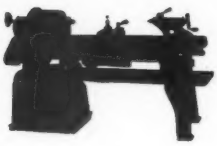

This Vard Multiple Lathe Stop was developed to increase production in our own precision machine shops. We found that it would greatly reduce lathe set-up cost and speed production by a good 20%. It was originally designed for the 9 and 10 inch South Bend Lathe but because of its heavy structure we recommend its use on larger lathes, provided it is properly fitted with a rigid base adapter.

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VARD INC.

PASADENA 8, CALIFORNIA

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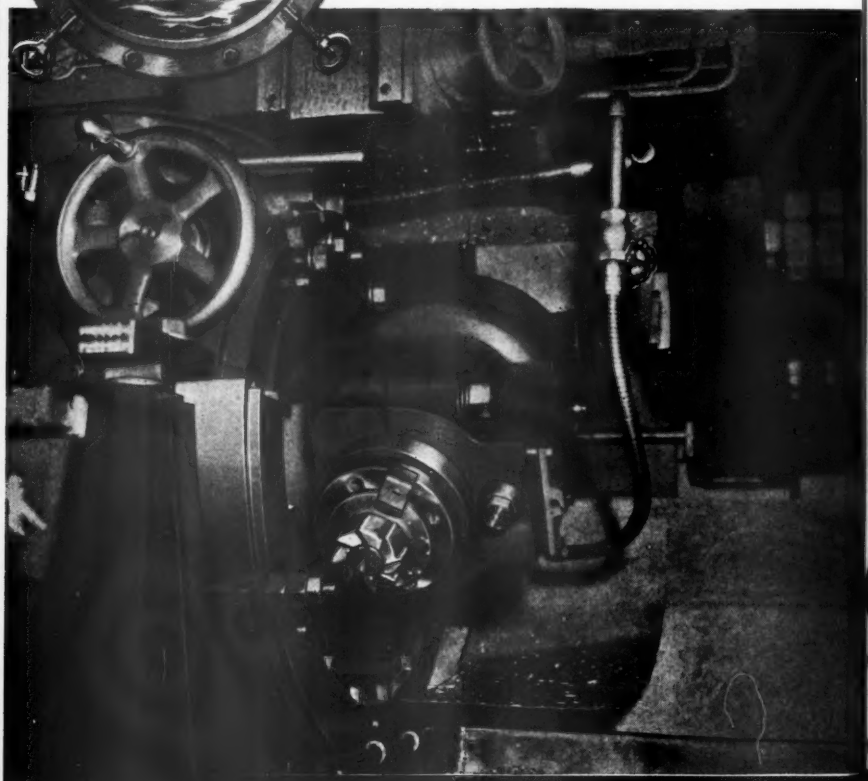
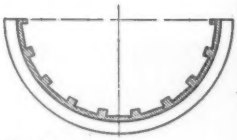


TOOL ROOM AND MANUFACTURING MILLING MACHINES . SURFACE BROACHING MACHINES . CUTTER SHARPENING

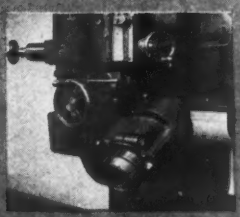


ON MACHINING SLOTS INSIDE HALF-ROUND BEARINGS

The slots in bearing struts always presented one of the most difficult machining jobs in shipyards. Two or three years ago when production was of little consequence, there was no urge to change, but with the requirements for more and more ships, something had to be done about speeding up this operation. A CINCINNATI engineered Universal Index Milling Attachment, on a CINCINNATI 28" Series Vertical Hydro-Tel Miller, solved the problem. The machine has the capacity and power for milling these large parts, and the attachment is designed so that it may be indexed to several milling positions within a radius of 180 degrees. This method of machining the slots is much faster than the previous method *. . the work requires only one setting and the attachment may be quickly indexed from one cut to the next.*

The attachment is a typical CINCINNATI Service Engineering development for more rapid production through the use of the right machine, fixture, and cutters. Talk over your milling jobs with this group of authorities; they may find a more profitable and productive method for handling your milling operations.

Right: CINCINNATI 28" Series Vertical Hydro-Tel Milling Machine. Specification catalog M-1018-2 gives complete information.



Above: Universal Index Milling Attachment. It has No. 50 standard taper hole; quick change collet; 1½ to 1 speed ratio, index plate for locating angular position of attachment spindle.

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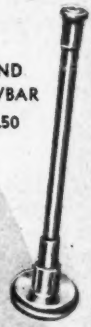

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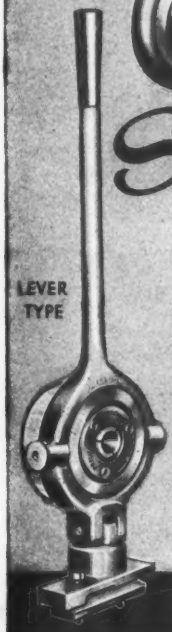

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TYPE

- Increases ½" collet capacity lathes to ¾".
- Ready for instant use and interchangeable on any 1½" x 8 thread spindle lathe . . . Atlas, Logan, 9" South Bend, Clausing, etc.
- Full Spindle Accuracy.
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... Because of regular
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lasted far beyond its
normal life expectancy.

Hours can be added to the useful life of cutting tools by a policy of regular resharpening. Sharp tools last longer, produce more and better work.

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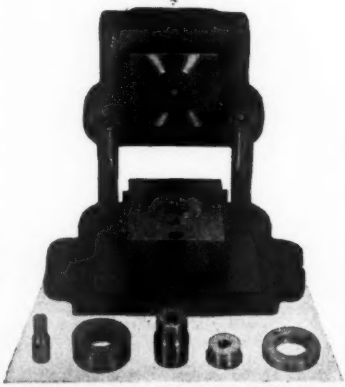

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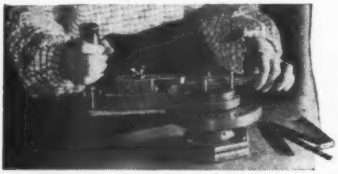

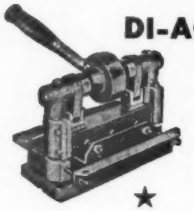

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Forms non-stock angles, channels or "Vees". Right or left hand operation. 3 sizes. Folding widths, 6", 12", 18".

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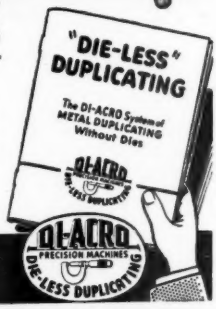

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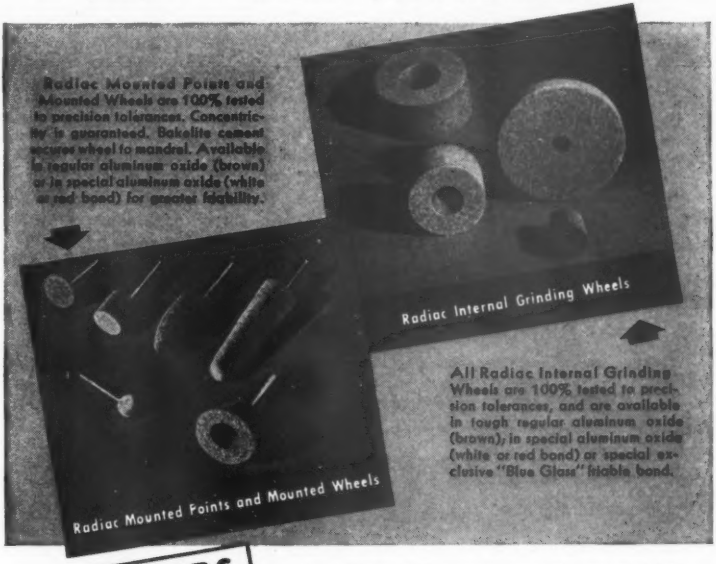
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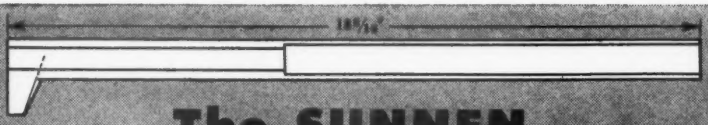

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"Will pay for itself many times over in the saving of scrap parts and time"

Massey Machine Company

The coveted Army-Navy "E" waves over the Sunnen plant —evidence of the important part Sunnen Equipment is playing in the war effort.

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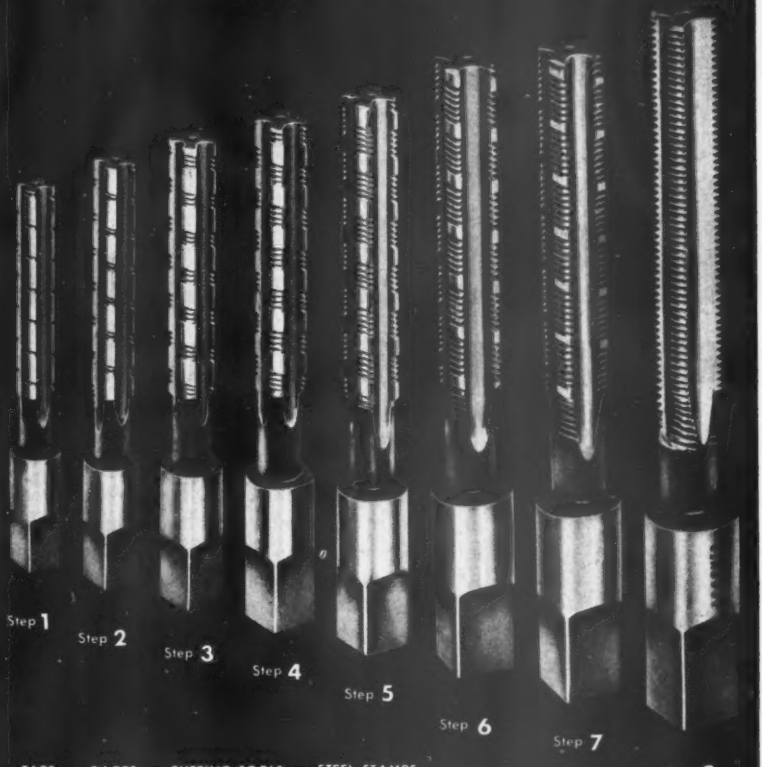

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THE TOOL & DIE JOURNAL

GEORGE J. HUEBNER • EDITOR, PUBLISHER

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Acceptance under the Act of June 5, 1934, authorized October 22, 1942

THE public is due for many pleasant surprises after the war—as new materials are released at the fighting fronts and converted into the products of peace.

Perhaps *you* are planning to utilize some of these new materials in your own processes. More power to you, if they give your customers a *better* product—or cost less—or create a bigger market for themselves.

But even the newest materials don't just "jump together." Quantity production will call for *more* drilling and reaming, no doubt. After the war, you can order Cle-Forge High-Speed Drills and Peerless High-Speed Reamers in the same confidence you have always had—that they will continue delivering top quantity *and* quality production per tool, per grind.

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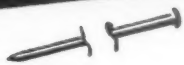


IN WAR, PLAN FOR PEACE

AMERICAN industry, fundamentally a system of free enterprise, is going to be judged on how successful it will be in forestalling and preventing severe unemployment at the war's end. The unprecedented scale of the problems of reconversion will constitute what probably will be the greatest challenge ever faced by the American businessman. In unreservedly accepting the challenge to duplicate in peace-time the achievements in the war years for the Armed Forces, industry's insistence upon the fullest cooperation of all Government agencies would seem wholly justified.

A big step in the right direction is the recommendation by the Senate Committee on Post-War Economic Policy and Planning for the creation of an Office of Demobilization. This would initiate a study of effective means for enabling our system of free enterprise to provide "full" post-war employment. Despite our aversion to more and ever more "boards" and "offices", we believe that our elected legislative representatives should be in continuous close touch with what must be done to cope with this great responsibility.

The necessity for earnest study by plant executives and owners of the present abnormal industrial conditions, and of the severity of the shock that can accompany reconversion, can hardly be questioned. For most businesses there would be first, a period of transition and later, one of reconstruction, accompanied by all the difficulties and responsibilities which are the result of our dislocated economy during the war. These should be the concern of employers and employees alike. Too often these groups seem to lose sight of their common interests. Both want and need continuing employment. Such employment provides both a living income for the employee's family and purchasing power for his firm's products, materials or services. Planning, therefore, is decidedly not a job only for employers.

War production demands have brought many new businesses into being—both large and small. Logically, they are determined to become parts of our permanent industrial structure. An example is the Higgins group of enterprises in and around New Orleans. A Wall Street Journal correspondent writes that almost 20% of the entire working population of that city is already employed in the four Higgins companies, and predicts that this percentage will rise to perhaps 33%.

The comment of the Federal Reserve Bank of Atlanta is that South Louisiana is fortunate in obtaining new industrial facilities with "great peace-time usefulness" about three-fourths of which seems to be readily convertible to civilian production. Of a total of $352,000,000 of new capacity, 21% represents metal working, 27% petroleum, 21% chemicals. From the West Coast we hear rumors that there may be a new automobile or two to compete with those which we have been buying for years.

In the post-war period competition is likely to come from most unexpected sources. For example, one of our largest flour mills has become an outstanding producer of fine precision parts and tools. That the big fellows are tremendously alive to the competitive implications of these new industrial areas and organizations is evident from carefully conceived plans which they have under consideration.

Such a plan, looking forward to full capacity post-war production as early as possible, may be cited. The corporation has many divisions. Each of them manufactures parts of its own end product. Others are obtained from associate divisions; still others from independent sources. In one instance these quantities are respectively 20%, 60% and 20%. Although the corporation's volume of war goods produced in all its plants is greater than the volume of its peak peace-time production, it has never been necessary to utilize all plant floor space and equipment.

War production is still moving in record volume. It can and will be so maintained as long as necessary. It must be readily apparent, however, that if this corporation and others like it are not permitted to take steps to initiate manufacture of tools and parts required for peace products before actual suspension of war production, there will be a transition period of unproductive activity. This spells "unemployment" in any man's language.

The plan logically pre-supposes that contract cancellations and output reductions will become more frequent and larger. It is indisputable that, prior to final victory, the manufacturer of essential civilian goods will be needed not only to maintain the American home and the services that contribute to it but, specifically, to absorb workers released as the result of war contract cut-backs and our returned soldiers.

We have heard much about changes on the home front that will come with the great invasion of Europe. Adjustments had to be made with the fall of Italy; even greater adjustments will come with the defeat of Germany.

The plan we are describing suggests a period of combined operations —war goods as required, peace goods as permitted. It is assumed that the latter will increase with the fall of Germany. Beginning then, it is proposed that peace goods production be stepped up as the demand for war goods declines. It is even conceivable that in an individual plant, careful planning will permit a balanced state of employment to be maintained. As ultimate victory approaches, the emphasis will be on transition more and more heavily to post-war goods. Eventually such production should absorb all usable facilities and manpower.

New machine tools and tooling to actuate this policy are being purchased. This of itself is a timely procedure because builders of machine tools, accessories and other equipment now need orders and tool and die shops will soon begin to have open hours.

From every viewpoint this appears to be a well-thought-out plan. It is obvious that it must be fitted to the circumstances which govern the individual manufacturer. There is no thought of lessening the required war goods production in the slightest degree, but provision is made for promptly "taking up the slack" which will most certainly become a reality when, and as, more and more war contracts are terminated.

Editor

PRODUCTION PROBLEMS

IN SMALL PARTS MANUFACTURE

by C. P. Roberts, M. E.
and
E. B. Neil, M. E.

This article, the first of a series, deals with those general considerations essential as an approach to the specific problems and their solutions that are to follow.

The authors are associate professors, Ohio State University, Department of Mechanical Engineering. Both have had extensive experience in the manufacturing field acting as technical counsels for numerous companies. ***In this presentation of some of the problems of small parts manufacture, the production and design experience of the authors is combined. The problems covered are based upon actual "case histories" taken from current production, and in most cases involve parts for aircraft or their components. Some emphasis has been placed upon the manufacture of aluminum parts since this metal not only is of the greatest importance in aircraft production but will have extensive post-war applications in other fields as well.***

EWP Tech. Ed.

WORLD WAR II created an unprecedented demand for precision made, small intricate parts of almost countless specifications and for applications virtually unknown to peacetime industry. Comparable production was that of "instrument manufacture", a field of its own and one wherein the "touching up" and "fitting" of mating pieces was a more or less accepted practice. Consequently assemblies were often accomplished by selection. While dimensions were standardized as to permissible limits, surface finishes—a matter of judgment—were subject to variations of such relative magnitude as to often preclude working within the established tolerances. The instrument makers preferred to supply the assembled or sub-assembled mechanism with mating parts put together to assure the desired fits.

With the advent of war, the facilities of manufacturers other than those previously engaged in instrument work were brought into play to produce the urgently needed small parts. The combination of the need for secrecy in some cases, and the astronomical quantities required, dictated that a manufacturer concentrate on a few parts rather than the total variety involved per assembly. With other manufacturers responsible for components destined for the same assembly all production had to be on a truly interchangeable basis. There could be no assembly by selection and no time for hand or bench fitting operations.

To the average production man all this might seem nothing more than has been accomplished in many fields of manufacture prior to the war and in many more since the war began. From the standpoint of organization, he is right. That small parts may be handled by the same general methods and processes as large ones, at least in most cases, is also true. But the similarity ends there. Altho the basic methods and processes, turning, grinding, honing, etc., are the same, the applications of these processes, combined with the relative effect of small differences in dimensions, introduce many problems which the producer of larger parts seldom has to meet. When considering parts in the "small" category, the largest diameter is usually one inch or less, while the overall length may be several inches or more. The combina-

tion of small diameter with great relative length introduces additional problems when close tolerances must be held. Small parts must often be produced, not only with threaded portions of different diameters, but also with splines, indexed serrations, undercuts, upset ends, slots, grooves, tapers, etc., hardened, ground, plated or otherwise finished, all without the maker ever seeing the assembly in which his component must function.

Small Size Reduces Tolerances

The effect of small relative size on dimensional limits and clearances must be fully recognized by the designer and producer. Where .001" per inch of diameter applies, .00025" becomes the tolerance to hold where the part is reduced to ¼" diameter—and this can be considered a liberal figure. If the 1" diameter is to be made within .0003" limits, the ¼" diameter may be subject to a tolerance of less than .0001". Thus a half "tenth" becomes the unit of measurement and what have heretofore been considered "toolroom standards" become production problems in the small precision parts field.

Machines and Tools Must Be Rigid

Where tolerances such as these must prevail in high production it is obvious that machine rigidity and accuracy are paramount. Spindle bearings must be of the pre-loaded type. No machine with any measurable run-out or looseness can be tolerated. Tool supports must be rigid and all gibs must be uniformly taken up. Steadyrests, follower rests and other means of preventing work piece deflection are most essential. The finest toolroom equipment may not be accurate enough for this type of production unless frequently checked and carefully maintained.

Designing for Production

Without being unduly critical of designers, for they too have their problems, it is nevertheless true that many of the parts projects, from which the problems to be discussed were selected, indicate a lack of knowledge on the part of the designer of machining and other production practices. In many cases this lack results not only in additional machine operations but often necessitates hand or bench operations. It has so frequently been said, "anyone can design parts, but it takes a designer with production experience to design parts that can be made." In small parts manufacture such errors in design are most critical because in some cases only one production method can be employed even with correct design; hence improper design renders the part "unmarkable" according to the specification limits. Then there are cases where the plant is not equipped for the indicated process, whereas with a simple modification in design the existing facilities could be utilized. Most serious of all, from the standpoint of waste of man-hours, machine-hours and materials, have been those many cases where the extremely close tolerances specified were entirely unessential to the function and quality of the part.

Effect of Tool Form and Finish

Altho the importance of the proper angles forming the cutting edge of a tool is well recognized, minute variations and changes, when working small parts, have a much more pronounced effect, relatively, upon the speed of cutting and quality of finish than in the case of larger parts. This applies particularly to small tools including drills, taps and reamers. Oftentimes the product of one small tool manufacturer will vary greatly in performance from that of a similar tool by another manufacturer due to differences in tool design that can be identified only by most careful gaging.

Effect of Material

Just as with tool form, small differences in the materials being worked are significant. This applies particularly to the various forms in which aluminum alloys are produced. Castings, forgings or rolled sections all require different treatments even though the alloy constituents may be almost, if not exactly, the same.

Gaging Problems

The gaging problems confronted by the small parts manufacturer have proved to be principally due to lack of equipment with which to check conformity to existing standards for surface finishes and thread forms, including also insufficient details as to the angles, fillets and truncations involved. Differences also existed between the gages used by inspectors and those of the parts maker and in the way the gages were used.

Material Being Tapped	Lubricant
Allegheny Metal	Sulphur Base Oil
Aluminum	Kerosene & Lard Oil
Bakelite	Dry
Brass	Compound or Light Base Oil
Bronze	Compound or Light Base Oil
Bronze—Manganese	Light Base Oil
Copper	Light Base Oil
Die Castings—Aluminum	Kerosene & Lard Oil
—Zinc	Compound
Duralumin	Compound or Kerosene & Lard Oil
Fiber	Dry
Iron—Cast	Dry or Compound
—Malleable	Compound or Sulphur Base Oil
Monel Metal	Sul. Base Oil or Kerosene & Lard Oil
Nickel Silver	Sul. Base Oil or Kerosene & Lard Oil
Rubber (Hard)	Dry
Steel—Cast	Sulphur Base Oil
Steel—Chromium	Sulphur Base Oil
Steel—Machinery	Compound or Sul. Base Oil or Kerosene & Paraffin
Steel—Manganese	Compound or Sul. Base Oil or Kerosene & Paraffin
Steel—Molybdenum	Sulphur Base Oil
Steel—Nickel	Sulphur Base Oil
Steel—Tool	Sulphur Base Oil or Kerosene & Lard Oil
Steel—Tungsten	Sulphur Base Oil
Steel—Vanadium	Sulphur Base Oil

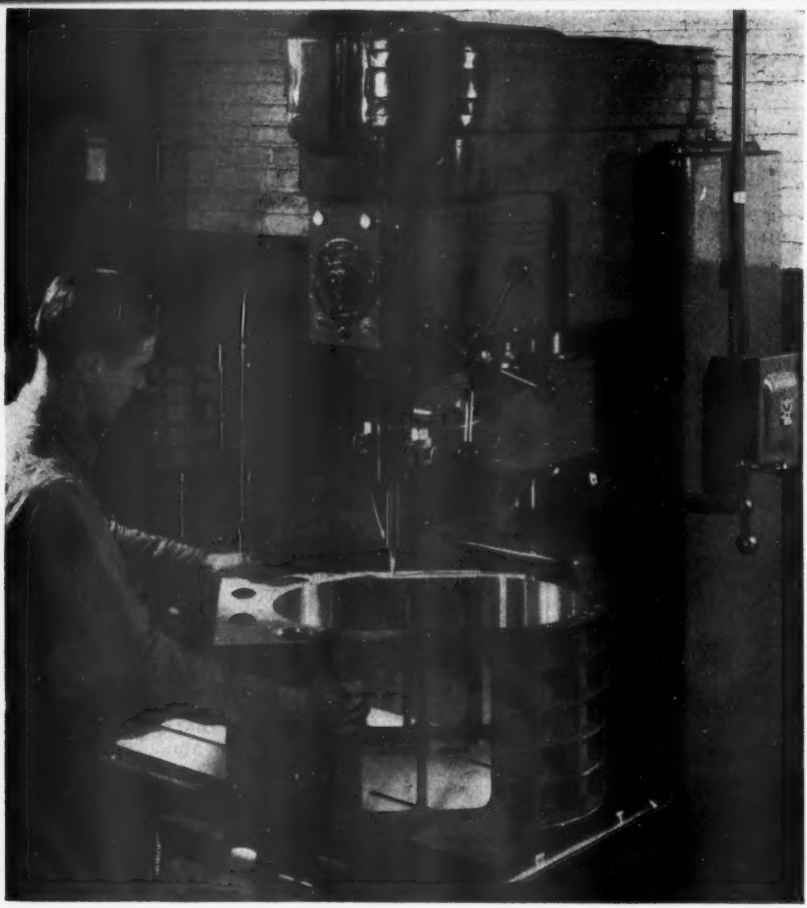
Aluminum and Temperature

Industry has had extensive experience with aluminum since the earlier days of automotive manufacture when this metal was commonly used for crankcases, transmission cases, pans, floorboards, fenders and bodies. Cylinder heads and pistons, however, have represented the bulk of more recent production. These are relatively large pieces and of fairly simple form. Only in the aircraft field where prewar production was in lots of dozens or hundreds has this metal had any varied applications. For this reason many production men had to familiarize themselves with it when starting production of current aircraft components and the small parts maker was no exception. His problem was further intensified by the fact that when working to limits in ten-thousandths the high expansive rate of the metal aggravated tolerance problems and gaging. Body heat radiation was enough in some cases to affect results, hence gaging in temperature controlled inspection rooms is essential when tolerances are small.

Tapping Pipe Threads in Aluminum

Producing smooth and correctly formed threads in aluminum, never an easy job in small parts production, is doubly a problem when the tolerances specified are those of a class of fit designed to withstand high pressures, as is the case with pipe threads. In pressure systems a commonly used size is the ¼" pipe thread (Briggs), produced according to Army-Navy (AN) specifications. ⅛" and ⅜" pipe threads are also of wide application. To meet AN specifications pipe threads must pass inspections by thread and truncation gages.

In the case of one pressure fitting component, a full thread throughout the length of the hole was required with no permissible shake upon insertion of the truncation gage. In addition, the threaded hole ran into a hole of the same diameter as the pipe thread root minimum. In order to avoid enlarging the latter hole when running the tap in far enough to attain full thread depth, it was necessary to dub off the end of the tap. The dubbed tap did not cut the same thread form as the full tap, prob-



Warner & Swasey Precision Tapping and Threading Machine. Designed to tap or cut threads at speeds required by mass production and is capable of holding threads to Class 5 tolerance in plastics, aluminum, magnesium, bronze, nickel, or hard steel alloys and stainless steels. Its special feature is a hardened and ground lead screw the upper end of which incorporates a fluted hobbing portion. For each different pitch tap, a corresponding lead screw is mounted on the spindle of the tapping machine. Brass guide fingers, after being cut by the lead screw hob, engage the precision lead screw and control the feed of the threading die or tap. This method of tap feed takes into consideration that where one piece of metal bears against another, wear and distortion are bound to occur. It was designed to eliminate any disadvantages arising with a solid nut tap feed because of loose play or excess tightness between the nut and the lead screw. Prolonged tap life is assured by a safety clutch which is adjustable to the safe torsional resistance of the tap and material. Upon becoming dull, or if the tap encounters chips in a blind hole, the cork-insert disc clutch releases instantly and the tapping operation is safely halted. The operation can be resumed after the obstruction is removed without endangering the accuracy of the threading job. Another feature is a sensitive and positive depth control accurate to within .005". The machine will cut either internal or external threads with equal facility and right or left hand as desired.

Material Being Tapped		Speed in Feet per Minute		
		Carbon Taps	Regular High Speed Taps	"Maxi" High Speed Taps
Allegheny Metal		*	15–25	20–30
Aluminum		45–50	90–100	100–110
Bakelite		*	60–70	70–80
Brass		45–50	90–100	100–110
Bronze		20–30	40–60	50–70
Bronze—Manganese		*	30–45	35–50
Copper		45–50	90–100	100–110
Die Castings		30–35	60–70	70–80
Duralumin		45–50	90–100	100–110
Fiber		*	80–90	90–100
Iron—Cast		*	70–80	80–90
Iron—Malleable		*	35–60	45–70
Monel Metal		*	20–25	25–30
Nickel Silver		*	75–85	85–95
Rubber (Hard)		*	80–90	90–100
Steel	Cast	*	20–30	25–35
	Chromium	*	20–30	25–35
	Machinery	20–30	40–60	50–70
	Manganese	*	10–15	15–20
	Molybdenum	*	20–30	25–35
	Nickel	*	25–35	30–40
	Stainless	*	15–25	20–30
	Tool	15–20	25–35	30–40
	Tungsten	*	20–30	25–35
	Vanadium	*	25–35	30–40

*Carbon steel taps are not recommended for these materials.

ably due to the fact that dubbing changed the lead of the tap. This was the case even when select precision ground taps were used.

Analysis showed that the method of holding the tap in the tapping machine affected the result. Floating the work helped in cutting the thread to size, but did not entirely correct the trouble since the slightest amount of tap run-out tended to bore the thread oversize. Using a tapping machine setup which allowed the tap to float was also insufficient. Apparently the basic problem involved was that when a straight hole is taper tapped, the amount of metal removed is so great that good threads cannot be cut. By first removing the excess metal by taper reaming, the unthreaded hole size was made proportional to the threaded size, which resulted in uniform removal of metal or uniform tooth load during the tapping operation. This, when used in combination with floating either the work or the tap, resulted in producing threads that could pass inspection.

In the tapping of a blind hole, or its equivalent, for a class III fit, steps must be taken to assure a full thread form throughout. By blind hole equivalent is meant a hole, which, beyond its threaded length, becomes of reduced diameter. At the reduction the resultant shoulder may be flat or angular to accommodate, for example, an insert, gasket or valve seat. In such a case, machine tapping with a plug tap, followed by hand tapping to depth with a bottoming tap does not produce a full thread to the entire depth. Only by counterboring the bottom of the hole to a diameter greater than the major thread diameter, and for a sufficient distance from the bottom to permit the maximum diameter of the tap to clear or break through, can a true thread form be produced to full depth. Even if a few threads are thereby elminated a wide counterbore need not necessarily result in a sacrifice of thread strength since more than enough threads for required strength are usually speci-

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WELCOME HOME, PAUL REED

This month the TOOL & DIE JOURNAL staff welcomes the return of Paul L. Reed, who for three years prior to his call to active service was Assistant Editor. Having been a member of the Officers Reserve Corps for more than 20 years, it was natural that Paul Reed should enter the service as early as February, 1942, when he went on duty as Major of antiaircraft. Promoted to Lieutenant Colonel in September of the same year, he served successively as 90 mm battalion commander in an antiaircraft regiment, as commander of a 40 mm separate battalion, as a group executive, and as a firing point commander.

A recent regulation, which provided that reserve officers over 38 years of age who had not received combat organization assignments would be eligible for discharge, permitted him to revert to inactive status. Colonel Reed served at Fort Eustis, Va.; Fort Sheridan, Ill.; Camp Davis, N. C.; Camp Hulen, Texas; Fort Bliss, Texas; and Camp Callan, California.

During his activity as TOOL & DIE JOURNAL Assistant Editor prior to 1942, readers will recall that Colonel Reed took part in the interesting early development of the TOOL & DIE JOURNAL as an authority on tooling and production. His return at this time, when a high volume of war production must be continued to provide the armed services with large quantities of war products required for winning the war, and when there is also the need for judicious planning for after-war production, will be received as good news by our readers.

WE KNOW YOU WILL UNDERSTAND

It is a matter of record that throughout the development of the TOOL & DIE JOURNAL we have endeavored to maintain the highest quality of editorial content. Likewise we have used, with few exceptions, only those fine coated papers which would assure quality of type and halftone reproductions thoroughly in keeping with the tool and product quality and precision workmanship which we describe and illustrate. Our format and page size have been so frequently commended by our readers that we continued them in the assurance that they provided a most satisfactory book.

The soundness of this policy has been thoroughly justified. The record of the loyalty of our readers and our advertisers is one of which we are very proud, and we believe that the new slightly smaller trim size, as of this issue, will require only a word of explanation.

In January and February of 1944 we tried to reduce our consumption of paper by reducing the number of pages. In order to continue according to our accepted percentage of editorial pages this reduction had to be accomplished by restricting the acceptance of advertising. Even this, however, was not sufficient to comply fully with the War Production Board's 1944 requirements, therefore the reductions in page size and weight of paper apparent in this issue. Our print page size remains as before.

We shall return to our former size, weight and quality of paper when the war-time emergency has passed. We hope that this may be soon, but during the intervening months we shall continue to strive earnestly to provide you and all of our readers with technical articles and data which have the utmost value in your tooling and production activities. As always, we welcome comments and suggestions from our readers.

SUCCESSFUL HARD-FACING OF DIES DEPENDS UPON PROPER ALLOY

HARD-FACING the wearing surfaces of dies for longer life has been a standard practice in many shops for years. Recently, as reported in a paper before the American Welding Society in Chicago, the problem of selecting the most suitable alloy for hard-facing has been reviewed, resulting in new and dependable conclusions. It has been found, as a typical example, that punches for hot operations such as shell piercing can frequently be protected by facing at low cost with an arc-welded deposit of a well-known nickel-base alloy formerly used only for its high corrosion resistance.

Another result of this study is that, in certain applications, the hardest grade of cobalt-base alloy can sometimes be applied to hot-work dies with even better results than can be obtained with somewhat softer alloys of the same type which have, until now, been selected because of their higher resistance to thermal shock combined with abrasion.

From these conclusions, it was inferred that a review of the selection of alloys would pay dividends on nearly all jobs involving the hard-facing of hot-work punches and dies. How this can be done is demonstrated by Table I.

Selection of Hard-Facing Material

The first step in approaching the problem of hard-facing a part is a review of the service to which the part is to be subjected. Some of the factors to be taken into consideration in determining the hard-facing alloy to use on the application are:

1. Is the part subjected to abrasion?
2. Is the part subjected to erosion?
3. Is the part subjected to corrosion? If so, from what acid or corrosive material?
4. Is the part subjected to heat? If so, approximately what temperature?
5. Is the part subjected to impact? To what degree?
6. Is the part subjected to thermal shock?

This analysis will frequently show that more than one factor must be taken into consideration. This necessitates checking the available hard-facing materials to determine which would be most suitable to handle this combination of factors. For example, one type of hard-facing material may have superior abrasion resistance but will not withstand severe impact; another may have a good abrasion resistance but will not withstand corrosion; still another type of hard-facing material may withstand all these conditions and yet not withstand thermal shock.

How these factors affect the selection of hard-facing alloy in specific examples will be shown later.

Application of Hard-Facing Material

The following points are to be considered in determining the welding procedure:

1. What is the analysis of the base material?
2. Is it necessary to heat-treat the base material before or after hard-facing?
3. How should surface be prepared?
4. What welding process should be used for the application?
5. Would brazing a casting or strip of hard metal to the part be more economical than hard-facing?

Certain types of hard-facing materials can best be applied by the oxy-acetylene method, others by the metallic or atomic hydrogen arc method. Still others work readily with any one of the three methods. Some hard-facing materials when applied by the electric arc will crack or have a porous structure. On many jobs surface imperfections are not permissible and one of the other methods of application must be used.

Selection of Base Material

When there is a choice of the base material, consideration should be given to the service to which it is subjected.

TABLE I

CHARACTERISTICS AND GUIDE TO SELECTION OF HARD-FACING MATERIALS

TYPE	HARD-FACING MATERIAL	RESISTANCE TO: ABRASION	EROSION	CORROSION	HEAT	IMPACT	THERMAL SHOCK	APPLIED BY	HARDNESS (As-Deposited)	TENSILE STRENGTH lb. per sq. inch	SPECIAL PROPERTIES
1	HIGH-HARDNESS COBALT-CHROMIUM-TUNGSTEN ALLOY	S	S	S	G	-	-	O-A	54 Rockwell C	47,000	HIGH WEAR RESISTANCE
								ARC	45 Rockwell C		
2	HIGH-TENSILE COBALT-CHROMIUM-TUNGSTEN ALLOY	G	S	S	S	S	G	O-A	40 Rockwell C	105,000	RESISTANCE TO WEAR, HEAT, EROSION, AND SHOCK
								ARC	31 Rockwell C		
3	HIGH-CHROMIUM IRON ALLOY	G	G	-	-	S	-		40-45*Rockwell C		FOR MANGANESE STEEL PARTS
								ARC	26-30 Rockwell C	40,000	
4	RODS WITH TUNGSTEN CARBIDE GRAINS IN A STEEL MATRIX	S	-	-	-	-	-	O-A	Not readily measurable		FOR EARTH-MOVING AND AGRICULTURAL EQUIPMENT
5	NICKEL-BASE ALLOY (with Cr, Mo, W, Fe)	-	G	S	S	S	S	ARC	200 Brinell	72,000 TO 80,000	RESISTANCE TO THERMAL SHOCK AND HEAT; MACHINABILITY

(S) SUPERIOR (G) GOOD (-) NOT OUTSTANDING (*) AFTER WORK HARDENING

For instance, if a part is subjected to impact and heat, a base material of high strength must be used. On hot-punching work, where considerable impact is involved, it is possible to make the punch of S. A. E. 1020, providing the stock being punched is not a heavy-gage plate. For punching material several inches thick, however, a high-strength base material such as S. A. E. 3140 must be used for the punch body.

Preparation of Part

The factors to be taken into consideration in the preparation of a part for hard-facing are as follows:

1. Should part be preheated to prevent cracking or help control warpage?
2. Has sufficient allowance been made to compensate for distortion and shrinkage?
3. Has part been properly cleaned?

On large parts or dies having a hard-facing deposit, it is often necessary to preheat to prevent cracking. For instance, when a large ring-shaped die is hard-faced, uniform preheating of the entire part reduces the welding time and minimizes the possibility of cracking the alloy deposit.

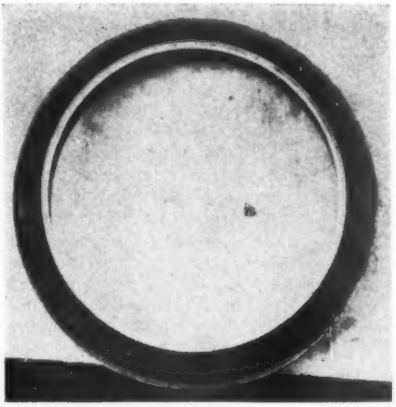


Fig. 1—Hot-trimming die which has been hard-faced with Stellite alloy No. 6 (Type No. 2) for trimming the flash from ring gear forgings.

Advantages of Hard-Facing

The advantages of hard-facing are:

1. Longer life of equipment, which can be indefinitely prolonged by repeating the process.
2. Fewer replacements with resultant savings in labor charges and lost production time.
3. Utilization of low-alloy steel as the base for wearing parts.
4. Salvaging or reclaiming of worn parts.
5. Savings in power consumption.
6. General increase in operating efficiency.

A part that is hard-faced—a shearing or trimming die is a typical example—remains sharp longer, thereby reducing the power consumption of equipment—which is a material saving. Hard-facing also increases production and saves time by reducing the number of shutdowns of equipment. For instance, when a hard-faced part lasts four times longer than the original part, three shutdowns are eliminated. In some cases the hard-faced part makes possible a speed-up of equipment and thus contributes in another way to increased production.

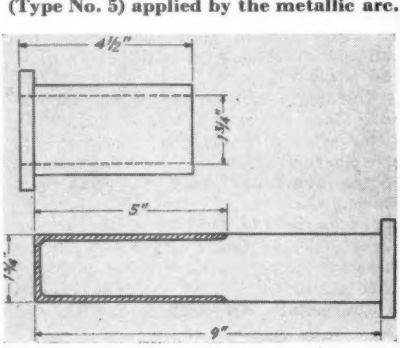
An outstanding feature of this method is that the parts can be hard-faced repeatedly. In one drop-forge plant in the Chicago area a resurfaced hot-trimming die has been maintained in operation for over eight years without replacement. While the cost of initial application and grinding in many cases approximates the cost of a new part, the additional life obtained makes the ultimate cost substantially lower.

Choice Between Two Alloys

Most hot-trimming dies used for trimming the flash from ring gears and other forgings of both plain and alloy steel can be hard-faced with an alloy of Type No. 2. This alloy type has been most widely used (Fig. 1). The die shown, which is for hot-trimming a ring gear forging, was originally made of a special steel. Its life averaged approximately 2,000 pieces. Following the application of an alloy of Type No. 2 to an S. A. E. 3140 steel base 43,000 pieces has not been unusual.

More recently a nickel-base alloy of Type No. 5 has been used for hard-facing hot-work punches and dies, especially when the operation involves thermal shock. Type 5 alloy can be applied with the electric arc, is machinable, and requires no heat treatment. One punch on which this metal has been applied is used for piercing a 1¾" diameter hole, 4½" long, in bushings of a nitriding steel. Due to the depth of the hole, the punch is water-cooled to prevent overheating. It is obvious that the factors to be considered in determining the hard-facing alloy to be used are heat, impact, and thermal shock. Because of these conditions, Type No. 5 was chosen. After it was deposited by the electric

Fig. 2—Detail of a hard-faced punch used to pierce alloy steel bushings. The hard-facing material is Hastelloy alloy CHF (Type No. 5) applied by the metallic arc.



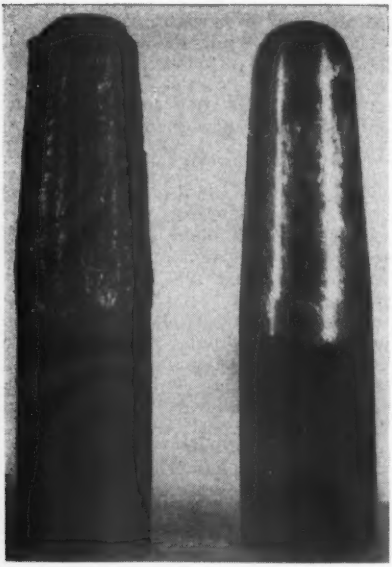


Fig. 3—Punch used for piercing 75-mm. shells. Hastelloy alloy CHF was applied to scrap punches after machining them $\frac{1}{16}$" undersize. Left—as welded; right—after machining the deposit to size.

arc, the surface was machined to size in 15 minutes. This hard-faced punch (Fig. 2) produced between 3,000 and 4,000 parts before it had to be resurfaced. Prior to hard-facing, the punches used could pierce only 100 pieces before replacement became necessary.

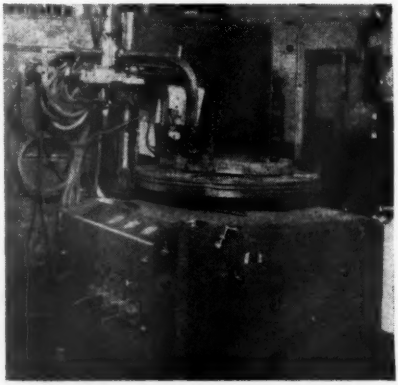
Figure 3 shows piercing punches used for punching 75-mm. shells. Scrap punches were used and were machined undersize $\frac{1}{16}$" on the diameter and nose before hard-facing. A review of the operation showed that this punch too had to withstand heat, impact, and thermal shock. The heat was excessive due to the depth of the hole being pierced and, since the punch was immersed in water after each piercing operation, severe thermal shock occurred. A review of the available hard-facing materials showed that there were just two that might withstand this thermal shock—alloys of Types No. 2 and No. 5. When these two were tested, No. 5 was found to be successful. A $\frac{5}{32}$" rod was applied by the metallic-arc process, and the deposit was machined to size.

The punch produced 2,000 shells with one application of hard-facing. During the run it was buffed after every 500 shells to improve the piercing action. The previously used tool steel punch produced 450 shells during its useful operating life, and had to be buffed every 150 shells. Hard-facing has been reapplied to this part several times since the operation was first tried and the original punch body is still in use.

Still another successful application of Type 5 alloy was on a forming and piercing punch and die for forging bomb booster caps. The alloy deposit (Fig. 5) is made only on those surfaces of the die and punch which are subject to the most extreme abrasion.

After approximately 6,000 caps have been punched, this punch and die require a new deposit of alloy. When refacing is necessary, the hard-faced surface is machined off and a new deposit is applied with the electric arc. The cost of fabrication by this method is equal to or slightly less than that of completely new dies. The economy of the operation is emphasized, however, by the fact that of the 2,000 caps that can be punched with steel punches, the last 500 to 800 are marked because of the washing out of the die. With a hard-faced punch and die, all 6,000 forgings are good, and the run is stopped before

Fig. 4 — The cost of hard-facing large ring-shaped parts in large quantities is reduced by using this single-spindle, automatic, valve hard-facing machine.



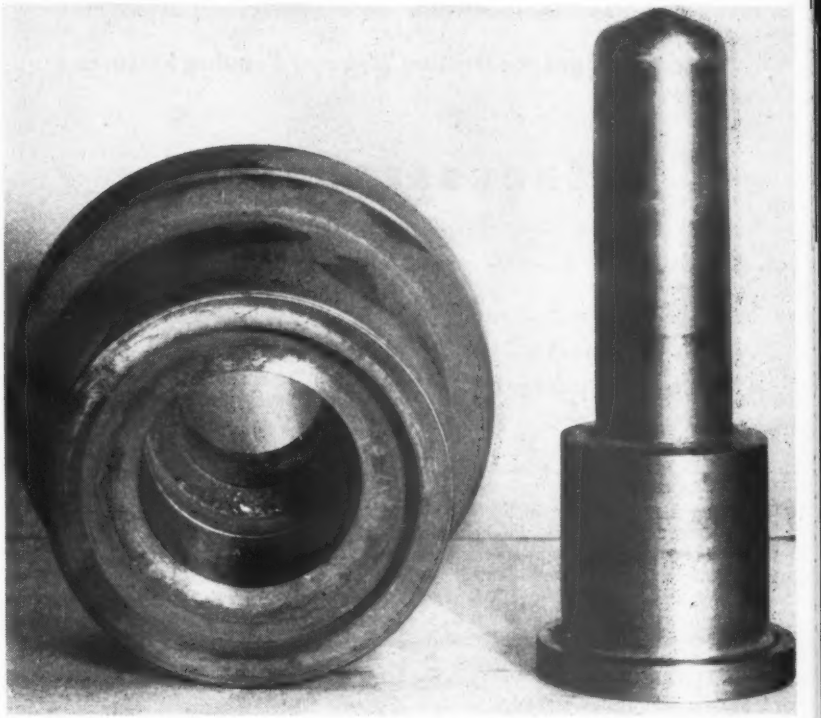


Fig. 5 — A hard-faced punch and die used for forging bomb booster caps. Both are hard-faced with Type No. 5 alloy.

heat checks can cause any marking of the parts.

Use of Hard-Facing Machines

The demand for uniform hard-faced parts to be manufactured in large quantities has brought about the need of reducing the cost of the hard-surfacing operation by mechanizing the process. One current application is a single-spindle automatic hard-facing machine (Fig. 4) for applying hard-facing metals to the surface of high-temperature, high-pressure, steam gate valve seats.

Other automatic hard-facing machines are being developed where production is high enough to warrant their application. Not only do they effect savings in material and time but they eliminate the fatigue factor for the operator and produce uniform, high-quality parts.

These examples and Table I were summarized to show the need for two general campaigns which should be followed in the constant war against wear:

First, *Analyze the hard-facing problem.* Select the correct hard-facing alloy to combat the severity and nature of the service conditions. Prepare the part properly. Allow for shrinkage, distortion, expansion, and similar factors. Use the best welding procedure. Machine or grind to meet service requirements.

Second, *Give a thought to future hard-facing.* Review your shop operations, machines, tools—even the scrap pile—to be sure that every useful part is salvaged that can be restored by hard-facing. Consider the possibility of standardizing on hard-faced parts where wear is most severe. Look, also, to the possibility of using jigs or preheating furnaces to speed up the application.

RECESSED JIGS

C. W. Hinman
Designing Engineer

THESE drill jigs belong in a class by themselves. The work is held in them securely without employing cams, keys, clamp bars, equalizers or a leaf. The method used to hold the work is that of tightening the two side screws *A*, end screw *B* which has a conical point, and screw bushing *C*, as illustrated in Fig. 152. In this case, both the jig and work are of cast iron or semisteel, and are machine finished on surfaces indicated by *f*. Eight holes are to be drilled in the work as seen in Fig. 153.

Before inserting the work in the jig, all the screws are backed away a few turns, and slip bushing *D* is either raised or removed from its liner bushing. The shape and general contour of the work piece itself is the determining factor that calls for this kind of a jig. Another factor is low output. The piece is generally U-shaped, it may be L-shaped, or a combination of these shapes, as shown here.

The dotted position of the work in the upper view indicates the method of "hooking" the open channel of the work around the end of bushing plate *E*, by a circuitous movement to permit orienting the piece properly. Then the work can be lowered into the jig and seated on the buttons or gage plates provided. Obviously, the piece must clear the top of bushing wall *F*. After tightening the screws and performing the drilling operations, the screws are loosened and the work is backed out of the jig. Another easy method for entering and "hooking" the work into the jig is suggested by position *G* in the lower view with the "in" and "out" directions shown by the

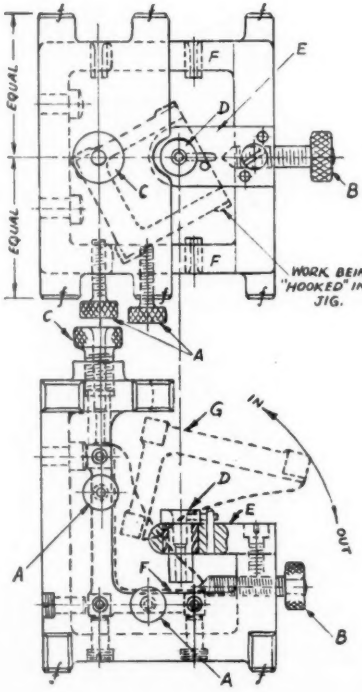


Fig. 152—Design of a drill jig in which the peculiar shape of the work necessitates "hooking" the work into position for drilling.

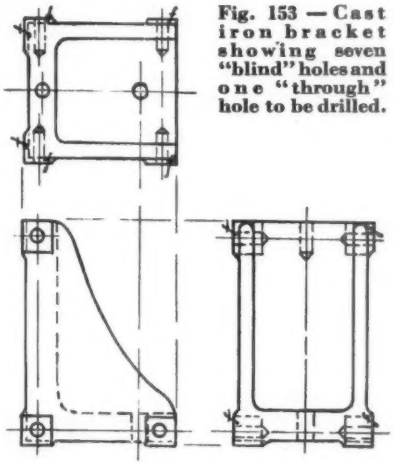


Fig. 153 — Cast iron bracket showing seven "blind" holes and one "through" hole to be drilled.

arrows. After the operator has used one of these jigs a few minutes, he can load and remove the work quickly and rhythmically.

Bushings *C* and *D* are unusually long. The actual guide holes for the drills are therefore relieved to less than one-half the bushing lengths. If bushing guides are too long the drills will heat, clog with chips, and may bind and break; if the guides are too short, they soon wear out and permit inaccurate drilling. The lengths of drill bushing guides are usually made 2½ times the drill diameters. Slip bushing *D* is provided with a pin driven in one side of its head. This is to prevent the bushing from revolving with the drill since the bushing pin contacts a vertical stop pin driven in plate *E*.

Recessed jigs are used because they are cheap to build and they are generally employed for handling small runs. Their main fault involves the time lost in loading and unloading as compared with a high output box jig provided with a hinged cover and a snap action latch-hook. However, some of them take the work easier than the one shown here when a simpler shape of work permits.

Tapered Keys

Tapered keys are used for holding and locking a large variety of work in tooling operations. Keys are easy to make and are excellent fasteners. They are a practical application of the spiral cam principle, because a tapered key is similar to the periphery on the edge of a flat cam which we can imagine as unwound and laid out straight. But the temptation to drive in keys harder than necessary is great and keys are frequently misused in this way. The inevitable result is scored and fractured work. Machine operators should try to avoid such severe use of keys, otherwise their real purpose and efficiency is defeated.

Figure 154 shows a cast iron piece, machine finished on both ends in a turret lathe, and which has a drilled and reamed center hole. This piece, and many similar ones, is drilled by placing the center hole of the piece over a vertical post in a jig, then aligning the work from one side by an equalizer, and locking it by driving a tapered key through a slot in the post and under the work. See Fig. 155. This method for holding and locking the work is used with many

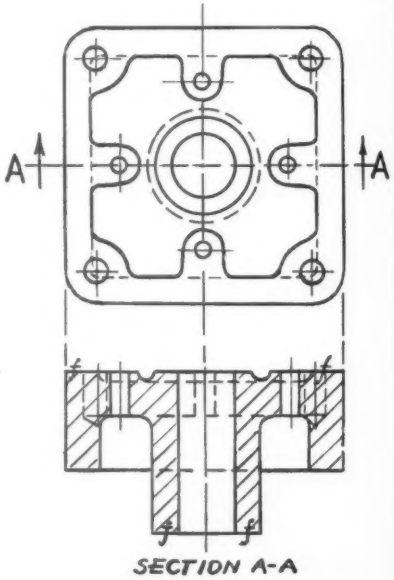


Fig. 154—Cast iron valve head with four "blind" holes and four "through" holes to be drilled in a jig.

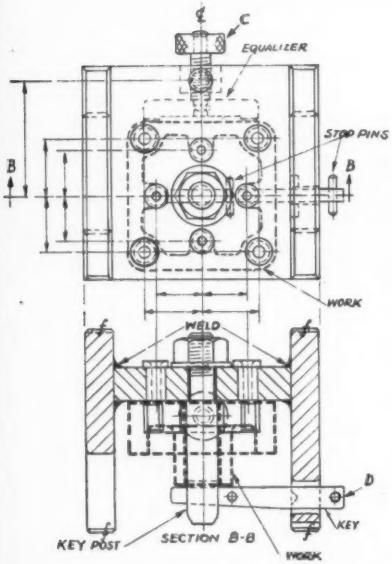


Fig. 155—Typical design for a drill jig that uses a post and tapered key for holding and locking the work.

other types of work and jigs, and several of them will be shown here. Two others were discussed under Figs. 123 and 127 in the November 1943 Tool & Die Journal in connection with angular stand jigs.

The jig illustrated in Fig. 155 is built up of three cold rolled steel plates which are welded together. Welded jigs are quickly constructed when compared either with making a wooden pattern for a cast iron jig body, waiting for the casting, and then having to machine finish most of the casting, or with the alternate method of milling the jig body from a solid block of machinery steel.

Feet are provided across the top of this jig to clear the nut that holds the key-post. When loading the jig, it is turned over on these feet with the key-post up. The work is placed on the post by inserting it through the center hole. Screw *C* is then tightened which advances an equalizer bar that aligns, or "squares", the work over the bushings in the jig. The work is then locked tight against the jig floor by sliding a tapered key over the work and through a slot in the post. The key is given a "light tap" with a rawhide mallet on its end at *D*.

If the angle of tapered keys is less than 7° the key will "stick tight" when driven in, but if a greater angle than 7° is used, the key can be removed easily. Keys for locking work in jigs and fixtures should have an angle of from 5° to 7°; this prevents them from loosening by machine vibration and thus spoiling the work in progress. Keys should be provided with stop pins, as shown in the sketch, to prevent their loss.

Figure 156 shows a die cast movement plate used in multigraph printing machines, locked in a channel jig by a thumb screw and a long tapered key. The thumb screw is provided with a rawhide tip in its point to prevent marring the work. Under the work, a loose steel pressure strip *B* protects the work from being marred by the sliding motion of the entering key. The small end of the key enters the jig toward the stop buttons *C*; this ensures that the work piece is in final contact against the stops.

The work has many die cast holes and numerous bosses which were omitted in the sketch because they are not involved here. The purpose of this jig is to drill additional holes and thus save the expense of adding them to the die casting mold. Long keys that operate against a pressure strip under the work are relieved as shown in the end view at *D*. This retains the pressure strip in its proper location, equalizes friction when inserting and removing the key and clears chips, dust and grit.

The work thickness and depth of the jig channel are both 1¼". The jig is loaded with its "channel up", the work being placed against the three stop buttons and the thumb screw tightened, then the key is inserted and lightly "tapped" in with a mallet. This is called an "auxiliary jig", a type which is usually a plate jig and often used for adding drilled holes in work to save the time and cost of altering main jigs, die casting molds, or punch press dies in which the initial work was done.

The working face of a key can be made considerably wider than its thickness, thus supporting the work better as in Fig. 157. In this jig two keys are used and each one has a stop pin to pre-

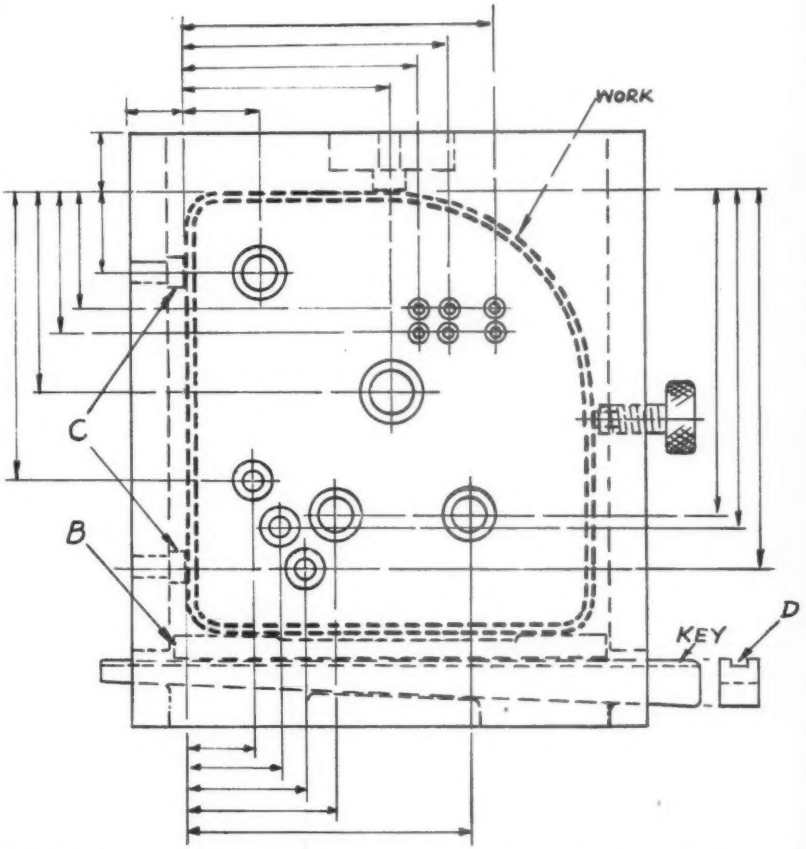


Fig. 156—Die cast work piece clamped with a tapered key in a channel jig for drilling 13 auxiliary holes.

vent loss of the key. The work is placed in the jig channel against stop *A* and side *B*. Next, the thumb screw is tightened which locks the work horizontally, and the keys are inserted across the work to hold it firmly against the jig floor. Vertical pin *C* serves as an obstruction and prevents loading the work wrong side up.

Attention is directed to the relative positions of stops *A* and *B* and the position of the thumb screw. The plan of locating and locking the work between angular stops by advancing one angularly positioned screw is a design to be worked out by the tool designer. The jig channel is built by welding together steel plates. Feet can be driven in the sides of the jig for a support if holes in the edges of the work are to be drilled.

Stepped Dimensions

The old time "button method" for indicating the positions of the holes for bushings, and drilling and boring them on a lathe, has been superseded by using modern jig-boring machines. For locating the jig-boring centers of the holes on the tool drawing, stepped dimensions are employed. Three different layouts in which this system is used are given in plan views of Figs. 155, 156 and 157.

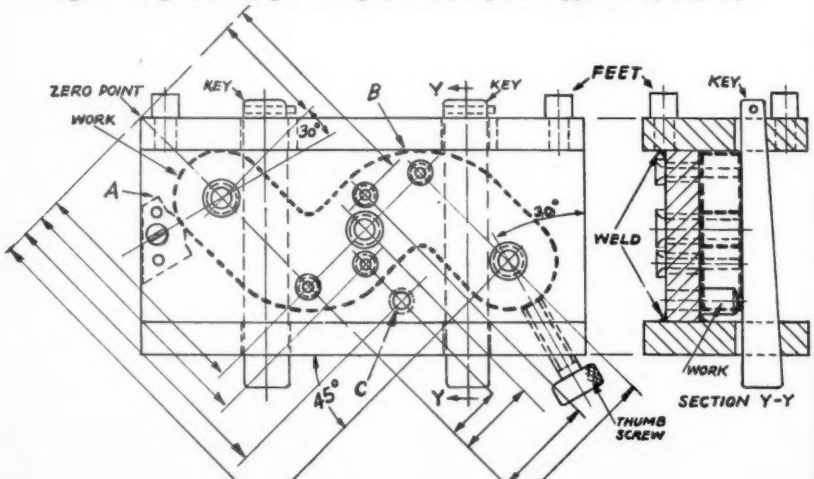
Stepped dimensions and decimal fractions are used because they give accurate distances to all the bushing centers from common registration lines. All hole centers are located from the same vertical and horizontal zero lines. This saves much time for the jig-boring operator. Without stepped dimensions, the operator must figure the position of each center from hole to hole, while his machine stands idle. Even though his slow and laborious computations might all be correct, errors would still be present due to his using the hole to hole method, in other words, to a lack of common registration lines. An error of only one-half of a thousandth of an inch from hole to hole becomes nearly $\frac{1}{64}$" at the last one of 25 holes.

This system eliminates cumulative errors, permits changing any dimension without interfering with others and, finally, the entire layout can be checked by summing up the consecutive differences and adding the first or least dimension, thus giving a sum that should check with the last or greatest dimension over all.

There are several methods in use for giving stepped dimensions, namely: Degrees of arcs for circular work; from both sides of the vertical and horizontal center lines for straight work, Fig. 155; and from the left end of the work piece toward the right and from the top downward for square or rectangular layouts, Fig. 156. The last mentioned is the method used most frequently. Combinations of these methods are also used as illustrated in Fig. 157. Here, the dimensions are given in an angular position. This avoids having to make many computations by trigonometry. The jig body is clamped on the jig-boring table to the angle given (in this case 45°), and the jig is then in a position where straight horizontal steps for drilling and boring can be done.

Giving stepped dimensions in any other way than shown here loses time because the work setting will not correspond with the direction of table feeds on the machine. Giving the dimensions from the wrong lines or in wrong directions is one of the common faults that beginners make, and notwithstanding that all their figures may be correct, none of them can be used until they are refigured and rearranged to suit the above precautions. The layouts given are easy ones whereas some layouts for bushing holes in large jigs involve several hundred holes and dimensions, and many of the computations require a working knowledge of trigonometry.

Fig. 157—Jig for drilling a Z-shaped flat steel piece supported by two keys.



THE WINNERS!

Tool & Die Journal Cutting-off Tool Contest Results

FIRST PRIZE — $25 War Bond

Albert W. Ehlers, Tool Supt.

McQuay-Norris Mfg. Co., Connersville, Ind.

SECOND PRIZE — $10 War Stamps (a Tie!)

Arthur F. Denkmann, Toolmaker

Pauly Jail Building Co., St. Louis, Mo.

and

Anton Staudacher, Die Shop Foreman

Dollin Corp., Irvington ,N. J.

THIRD, FOURTH & FIFTH PRIZES

Tool & Die Journal, one year

Alfred W. Heelas, Foreman

Piper Aircraft Toolroom, Lock Haven, Pa.

Stanley E. Polik, Standard Tool Insp.

Chevrolet Motor & Axle Plant, Buffalo, N. Y.

Peter P. Weidinger, Tool Engineer

The Bailey Meter Co., Cleveland, Ohio

In the January 1944 Tool & Die Journal we offered several prizes for the best solution to a cutting-off tool problem that had been put to us. In gathering the data incorporated in our initial answer to the inquiry we were impressed by the keen interest shown in cutting-off operations. We realized that much valuable "know-how" on the subject could be compiled from the actual experiences of those who had licked similar problems. Hence the contest. The response has been most gratifying, both as to the quality and quantity of factual, constructive and workable ideas contributed by busy men moved by a spirit of helpfulness. The ideas ranged from resourcefully rigged-up example of Yankee ingenuity to professional engineering analyses and recommendations. So many good ideas were adequately described in less than 800 words that we felt justified, in fairness to all entrants, in waiving that condition of the contest. The reference to the prevailing spirit of helpfulness is not just editorial fancy. We received letters from those whose contributions admittedly were being entered too late but who nevertheless wanted to help another shop out of a difficulty. We also received letters of commendation relative to the contest, expressing the thought that during the peak of tooling up for war production such a plan for stimulating the exchange of ideas would have been of great industry-wide benefit—and why hadn't we started it earlier? We're wondering the same! However, tooling for peace is going to be just as important to the economic welfare of the USA as was tooling for war to our physical survival. As long as we are encouraged and supported by reader enthusiasm we will try to make our trouble shooting contest a feature of increasing interest and importance.

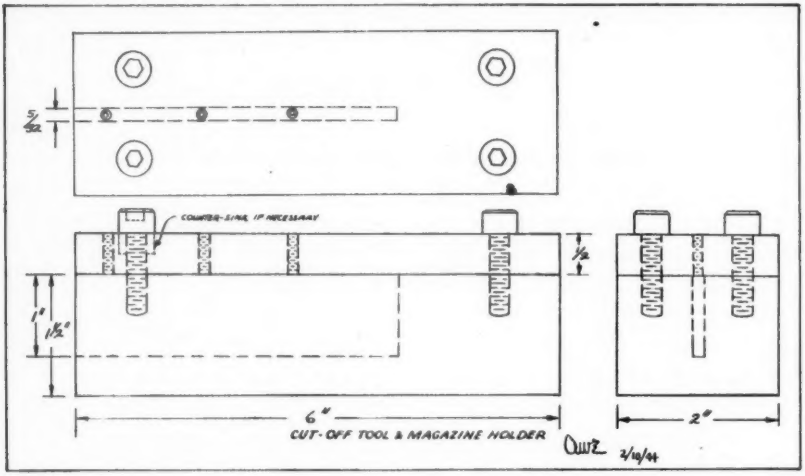
The Problem

The contest problem, based on the inquiry we received, is repeated here for reference and was as follows:

"We are manufacturing a cam roller, the completed dimensions of which are 1⅝" diameter by a 1" hole. These are cut from aluminum bronze rods 1¼" diameter, hot rolled. The material Rockwell's C34 to 40 and its chemical analysis is approximately 82% copper, 14% aluminum and 4% iron.

"These cam rollers are roughed out on our hand screw as well as our automatic screw machines. Now then, our difficulty is with our cutting-off tools which continually chip and break off because of the hardness of the material.

"We have tried high speed steel cut-



ting-tools, as well as diamond cutting-tools and we have now switched to carbide tools—all giving us the same trouble.

"These tools not only chip and break themselves, but very often the force of contact will also snap the tool which has been welded on to the holder.

"Is there a tool on the market that will eliminate this problem, namely, a tool that will not chip or break off, or is there a process a cutting-off tool can be put through that would guard against its chipping and breaking off?"

Prize Winning Letters

Dear Sir:

In reading the current issue of your magazine I noticed that a cam roller manufacturer is having trouble with a cut-off tool.

In cutting off steel of the same Rockwell "C" hardness, we have observed that in many instances the cut-off tool was too thin. This causes a tendency to "lead off" due to feed pressure, and, subsequently, to bind and chip due to loss of side clearance. A thicker cut-off tool, while resulting in greater stock consumption, has proved to be the economical solution.

In the particular case of the aluminum bronze application, I would assume that the roller was rough drilled and reamed on the automatic screw machine before the part was cut off. If this is true, the cut-off depth must be approximately .625" if comparable stock is to be removed by ID and OD grinding. This then would determine that the necessary cut-off tool length be approximately .6875".

A flat cut-off tool is indicated here, mounted in an adequate magazine holder for stability and ease of adjustment. It is primarily the same application we use to ring-groove pistons and also to groove parts, after heat treat, to close tolerances on hand screw machines. The magazine is a two piece fixture made from cold rolled steel, case carburized and ground. The lower part of the fixture is a rectangular piece of metal grooved to accurately fit the width of the cut-off tool with a plus tolerance of .001". The top part of the fixture is merely a cap secured by Allen screws to the lower grooved magazine and it incorporates small Allen screws that are

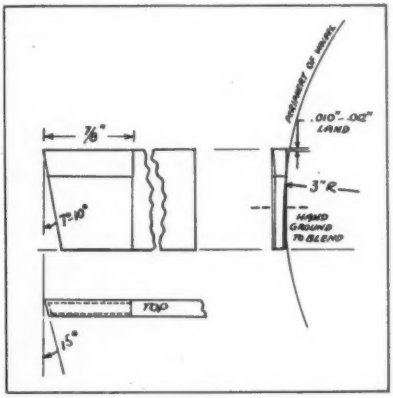
FIRST PRIZE—$25 War Bond

Albert W. Ehlers, Tool Supt.

McQuay-Norris Mfg. Co., Connersville, Ind.

to be tightened down on the cut-off blade to hold it in place. A long adjustment screw and lock may enter the back of lower magazine for length adjustment. The outside dimensions of the magazine block should conform to the tool holder available on the automatic screw machines.

The tool itself can be made from any of several materials, depending upon the



surface feet per minute of the automatics. However, if drills are used in conjunction with the cut-off operation and if the sfm is controlled by drilling practice, carbide tools will not cut properly. This leaves two materials, i. e., high speed steel or hard alloys (Stellite 98M, Rexalloy, Tantung G, etc.).

In either case the tool should be .156" (plus or minus .001") thick, one inch deep, and four inches long. The thickness of the tool should be carefully surface ground to fit groove in magazine block, leaving it .001" undersize to facilitate assembly. The tool has no back rake, has an end relief of approximately 7 to 10 degrees and a side relief of approximately 3 degrees. This 3 degree side relief is hollow-ground on a Cincinnati No. 2 Tool and Cutter Grinder using the periphery of the wheel after the proper angle adjustments have been made on the universal vise. This should be set so that the tool has a land of .010" to .012". Instead of the usual square end cut-off tool, or 90 degrees to the parallel sides of tool, this tool should have a 15 degree end cutting relief angle away from the work axis. This will provide easier entrance into the stock and will result in a better facing action. Of necessity, the tool will have to feed approximately .043" farther than a square end cut-off tool to accommodate the 15 degree approach to the work.

We have found that a tool of this design will have a safe tool life of four hours before it should be taken out for regrinding. The regrinding can then be accomplished by merely grinding the front end relief of seven to ten degrees compounded to the fifteen degree "away from work angle".

This four hour differential may be either too high or too low for the aluminum bronze in question; however, the idea of setting a definite time for removal and regrinding is to prevent the land and side-relief from being destroyed and the consequent necessity of reforming the entire cutting end of the tool.

It has been proven definitely here, on cut-off tools, that a high degree of grinding finish prolongs tool life. After the tool is end relief ground and side relief ground with a 60 grit aluminum oxide wheel, a buffing or polishing rubber wheel (impregnated with 320 grit abrasive) is used to attain a surface finish of approximately 20 to 30 micro-inches.

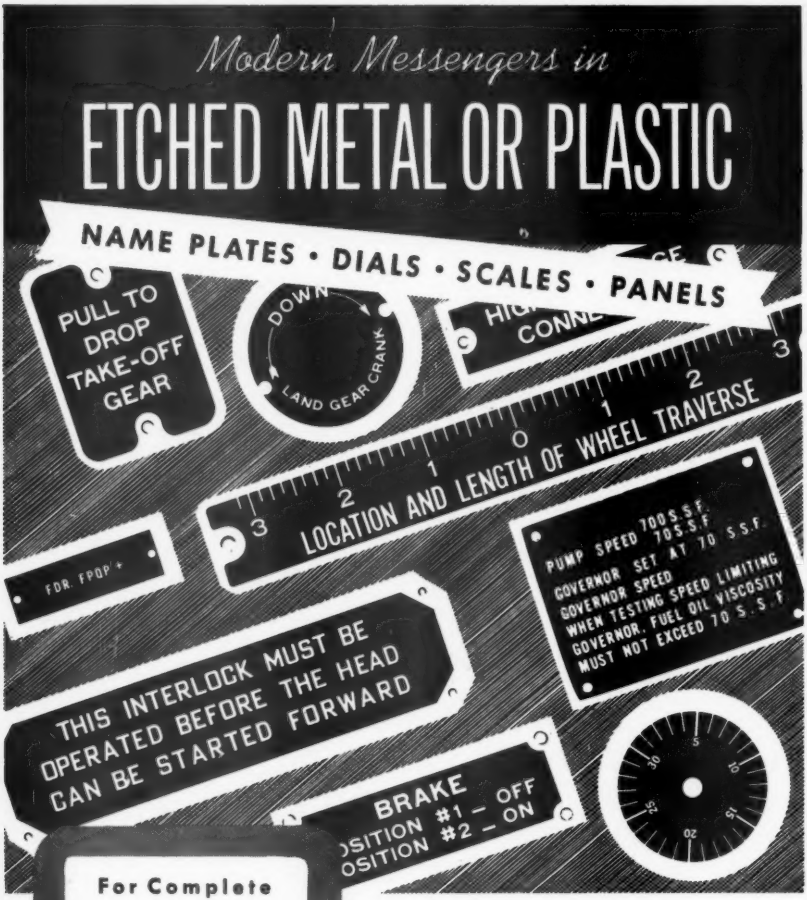
If our original assumption is wrong in that the sfm is controlled by drilling, then a carbide-tipped cut-off tool is indicated if the spindle speed is available. This tool should be made with a hardened high speed steel shank, recessed by grinding. Subsequent tip application with silver solder will drop the hardness of this shank from Rockwell C-62 to Rockwell C-42 approximately. This hardness gives a shank that will not permanently deform from feed pressure. A tip one-quarter inch in depth should be used and of a grade comparable to Carboloy 883. Experimentation with different grades of carbides will often pay dividends when a particularly tough cut-off problem is to be solved. The tool angles should be reduced from the above mentioned high speed tool angles in that the end relief should be near five degrees and the "away from stock" relief angle should be near seven degrees.

We have noticed here, when using carbide-tipped cut-off tools on especially tough jobs, that the operator tendency

(TO PAGE 108—PLEASE)

Modern Messengers in

ETCHED METAL OR PLASTIC


NAME PLATES • DIALS • SCALES • PANELS
PULL TO DROP TAKE-OFF GEAR
DOWN
LAND GEAR CRANK
LOCATION AND LENGTH OF WHEEL TRAVERSE
PUMP SPEED 700 S.S.F.
GOVERNOR SET AT 70 S.S.F.
GOVERNOR SPEED WHEN TESTING SPEED LIMITING GOVERNOR, FUEL OIL VISCOSITY MUST NOT EXCEED 70 S.S.F.
THIS INTERLOCK MUST BE OPERATED BEFORE THE HEAD CAN BE STARTED FORWARD
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Procedures in Plastics

THERMOPLASTIC OR THERMOSETTING

by Warren V. Prince

PLASTICS materials are divided into two general classifications by their reaction to the application of heat—thermoplastic materials and thermosetting materials. Generally speaking these two groups differ widely in their molding and fabricating techniques; they differ as widely in the application of their physical characteristics in service as finished products.

A thorough understanding of the differences between thermoplastic and thermosetting materials is of vital importance to anyone in the plastics field; this is particularly true for those men who must make decisions on the selection of materials. Such decisions should depend upon, first, the manner in which the plastics is to be used as a finished product and, second, upon the facilities at hand, together with the cost of producing the product. A knowledge of the fundamental characteristics of these two types of materials can save much time and money.

Thermoplastic materials are softened by heat and become hardened upon cooling. They may be resoftened time and time again; thus the word "thermoplastic".

Thermosetting materials are softened by heat at the time of molding or fabricating but are hardened by continuing that heat in the molding process until a chemical change takes place within the material, making it permanently infusible. Thus the word "thermo-setting". This chemical change is known as polymerization. Among molders it is generally referred to as "curing".

Thermoplastic materials may be likened to glass or sealing wax which can be melted over and over again. Thermosetting materials may be likened to concrete which, when once set up, becomes permanently hard and infusible. Thermoplastic materials are occasionally referred to as "cold-set" materials, whereas the thermosetting materials are referred to as "hot-set" materials.

Following are some of the outstanding characteristics of thermoplastic and thermosetting materials. Contrasting characteristics are in a parallel series. Bear in mind that these characteristics are not to be compared with materials other than plastics but are to be compared only between thermoplastic and thermosetting materials.

Thermoplastic:

1. Can be remelted
2. Hardens as a result of cooling
3. Poor dimensional stability
4. Soft
5. Tough
6. Has cold flow properties
7. Softened by heat
8. Becomes brittle when cold
9. Less fabrication time required (except with compression molding)
10. Scrap can usually be reclaimed and reused
11. Plasticizers control physical properties
12. Nearly all are flexible

Thermosetting:

1. Cannot be remelted after molding

2. Hardens from heat during molding or fabricating
3. Good dimensional stability
4. Hard
5. Brittle
6. No cold flow properties
7. Unaffected by heats from 240° F and up
8. Does not get brittle when cold
9. More fabrication time required
10. Scrap cannot be salvaged
11. Fillers control physical properties
12. Rigid even in thin sections

Thermoplastic materials as a class have poor dimensional stability; that is, they have a tendency to warp and change their shape with varying conditions. Some of these are:

1. Changes in humidity
2. Evaporation of plasticizers from the material
3. Temperature changes
4. Cold flow properties, resulting usually from forces applied
5. Absorption of liquids or certain chemicals

All but a very few plastics materials absorb moisture in varying amounts. If more moisture is absorbed on one side of a thermoplastic box, for example, than on the other side, the side exposed to the moisture will swell and expand more than the other side, causing a warpage. As a result, uneven strains or forces are set up within the material, cold flow begins and causes a permanent change of shape in yielding to such forces. Later, should the absorbed moisture leave the side of the box, the material would not return to its original shape if it had warped badly enough to cold flow.

Plasticizers

Plasticizers are chemicals added to thermoplastic materials during their manufacture to give them certain desired properties. Sometimes these plasticizers evaporate slowly from the material even after molding and cause the material to shrink and crack. This type of trouble developed in the earlier automotive plastic steering wheels. You may recall how many of them cracked and pulled apart. This can be reduced, however, by adding such plasticizers as camphor during material manufacture to retard the evaporation of other plasticizers.

If you have ever laid a thermoplastic part on a hot radiator or on top of an oven by mistake and, to your dismay, noticed, upon returning, the effect of the warping that had occurred, you would appreciate the effect of heat on thermoplastic materials. Heat not only causes expansion but softens the thermoplastic materials. When there is more heat on one side of a piece than another, a warp results, and especially when the material is softened. There is cold flow under such uneven stresses; cold flow becomes more severe as the temperature rises. Permanent distortion is the usual result.

The application of external forces to thermoplastic materials also causes cold flow. Such forces may occur at assembly or in service. For example, the thin back of a small camera case, held in place by two light spring chips, was warped by the force of these chips. The result was that light leaked into the camera. A thermosetting material should have been used.

Absorption of certain liquids or chemicals causes swelling in the same manner that absorption of moisture causes swelling. Warpage results. On the other hand, certain liquids and chemicals remove part of the ingredients of the plastic material, causing shrinkage or cracking.

Thermosetting materials, in general, have very good dimensional stability throughout the conditions mentioned above. There are very few exceptions and these apply only in special cases. These exceptions will be discussed when we discuss each material individually.

Thermoplastic materials as a class are definitely soft as compared with thermosetting materials. One exception, perhaps, would be polystyrene plastics, as we shall see later. This is the one hard and brittle thermoplastic material, especially with certain common formulations. All thermosetting materials are hard.

Toughness and softness go together. On the other hand, brittleness and hardness go together. This applies to materials other than plastics. The hardest of steels, for example, are very brittle, whereas the softest of steels are the least brittle.

As we have stated, all thermosetting materials are hard. If it were not for the

addition of certain fillers to control their physical properties, in this case the property of impact strength, the thermosetting materials would all be brittle too. Laminated materials, especially, are of high impact strength, which is the term in plastics meaning toughness or lack of brittleness. Laminated plastics are made up of layers of cloth or paper which are impregnated with plastic resin and pressed out under heat and pressure to cure into a solid plate or block.

Thermoplastic materials are generally not laminated, partly because they are tough without being laminated and partly because they cannot be made as hard and as dimensionally stable as the thermosetting materials. Hardness and toughness is the ideal combination for most applications.

Thermoplastic materials are tough as well as soft, with the one exception of polystyrene.

Thermosetting materials have no noticeable cold flow characteristics, a distinct advantage of thermosetting materials which should not be overlooked.

The application of plastics fittings for aircraft is an excellent example of this property. For aircraft these fittings should be tightened lightly with a

wrench in order to hold the pressures. Thermoplastic fittings cold flow in the course of time to relieve the forces of tightening and consequently relieve the tight seal, allowing leakage. They can be retightened time and time again and always flow out further. Thermosetting materials remain tightened indefinitely with no appreciable cold flow.

All thermoplastic materials become definitely brittle when they become cold. By cold we mean the extreme temperatures encountered by aircraft—to 70° below zero. They become so stiff and rigid at this temperature that most thermoplastics are nearly as brittle as glass. Some, however, such as ethyl cellulose, cellulose acetate butyrate, and "Resistoflex", are decidedly better than the others and can at least be flexed a limited amount without danger of cracking.

On the other hand, all thermoplastic materials soften when heated. Aircraft specifications for plastics designates 180° F as the upper heat limit. All but a very few of the thermoplastic materials become much too soft for operation at 180° F.

Thermosetting materials show practically no change in brittleness or softness within this range of 70° below zero F to 180° F.

The time required to solidify or harden plastics material during molding ranges anywhere from a quarter of a minute to thirty minutes for the conventional molding materials. This time depends upon:

1. The nature of the molding process
2. The thickness of the piece being molded
3. The temperatures used
4. The nature of the plastic material.

All plastics materials are poor conductors of heat. Consequently, it takes a noticeable period of time to change the temperature of a plastics material in a mold. With thermoplastics, the material must be cooled in the mold in order to harden it before it can be removed.

Most thermoplastic materials are injection molded because of the high speed of production that is possible. With this method, the material, which is furnished in granular or powder form, is fed with a hopper and pushed by a ram into the heating cylinder where it melts or softens; it is then forced through a nozzle and on into a closed mold which is at a temperature lower than the softening point of the plastics material. The temperatures and pressures must be regulated in such a way that the softened material fills out the mold cavity completely before the material can harden. The pressure is maintained through-

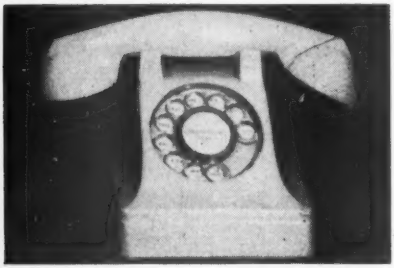
out cooling. Hardening by curing takes more time than hardening by cooling.

It is generally referred to among molders that the material is injected with a "cold" mold. It is cold only in a relative sense in comparison with the temperature of the softened material as it enters the cavity. Actually the mold would be quite hot to touch.

Injection molding is the fastest method of molding thermoplastic materials due to the fact that the material goes into a "cold" mold where it may start hardening immediately.

In compression molding the cold powdered or granular plastics material is placed into an open cavity of the mold and the mold is closed on the material. The heat and pressure from the mold melts or softens the material so that it flows freely and fills out the cavity to its extremities. However, for thermoplastic materials the mold must be cooled after the cavity is filled out under heat and pressure in order to harden the plastics material. This takes considerably more time for the molding cycle due to the necessity of alternately heating and cooling the mold itself, which is a sizable amount of steel and slow to change in temperature.

Compression molding of thermosetting materials requires no change in the tem-



perature of the mold during the molding cycle. The temperature and pressure required for softening the thermosetting material during molding is maintained and used for hardening the material by polymerization or curing. When the freshly molded piece has been permanently hardened with heat it can then be removed from the hot mold in the hardened condition.

Thermosetting materials require more curing time in compression molding than thermoplastic materials require for cooling with injection molding. These two methods are the most common production practices for the corresponding types of materials.

Now we can see how the type of plastics material, thermoplastic or thermosetting, definitely affects the production process. This is only one example of many of the effects on production.

The thickness of the piece being molded has a most decided influence on the length of the molding cycle, especially with thermosetting materials.

Due to the fact that plastics are such poor conductors of heat, a thick piece takes a long time to harden as a result of temperature change. The center of the thickest section of a piece would take longer to change in temperature because it is farther away from the heating or cooling surface.

The condition of this center must be observed very carefully during adjustment of the molding cycle. This is true of thermosetting materials because of their tendency to undercure at the center and to overcure at the surface. Fortunately, this condition does not exist with thermoplastic materials because they do not cure as they harden or set up. Warpage, bumps, and pits occur with thermoplastic materials due to uneven cooling. With compression molding of thermoplastics, pithiness and trapped air is likely to occur in thick sections.

With thermosetting materials which have thick sections, the simplest remedy is to reduce the temperature and increase the time. This, however, slows down the production rate. Curing time for thick sections of thermosetting materials is very much longer than cooling time for a comparably thick section of a thermoplastic material.

There are two production methods which improve this condition with thermosetting materials: (1) radio frequency heating of the material prior to molding; (2) the injection of thermosetting materials by special processes.

In either case the material goes into the mold cavity pre-heated to approximately the molding temperature before

final pressure is applied for setting up. This saves much time required for heating of the material during molding and shortens the molding cycle.

Differences in materials themselves

affect the molding cycle. Some harden fast and some harden slowly, depending upon the formulation. The material manufacturer can supply this information but only in a relative sense between materials. It is up to the molder to determine the rest depending upon the design of the plastics piece, the temperatures, the methods of molding, the mold itself, and the pressures applied.

Thus we can see how the type of material, either thermoplastic or thermosetting, can definitely influence production in many different ways. Generally speaking, thermosetting materials require more time for the molding cycle than thermoplastics.

Plastics scrap comes from excess material of the molding process in the form of sprues, runners, flashes, rejected pieces, shearings, punchings, drillings or other finishing or assembly operations.

Thermoplastic scrap can be salvaged and reused in a number of ways. It can often be ground and remolded again. Thermoplastics contain plasticizers for controlling their physical and molding properties. However, many thermoplastics lose a portion of their plasticizers in the molding process so that they cannot be used again for the same purpose. In this case, such materials will have to be used for a different purpose or reprocessed to replace the lost plasticizers.

Scrap from thermosetting materials that have been cured has no practical value at present. Molders discard thermosetting scrap.

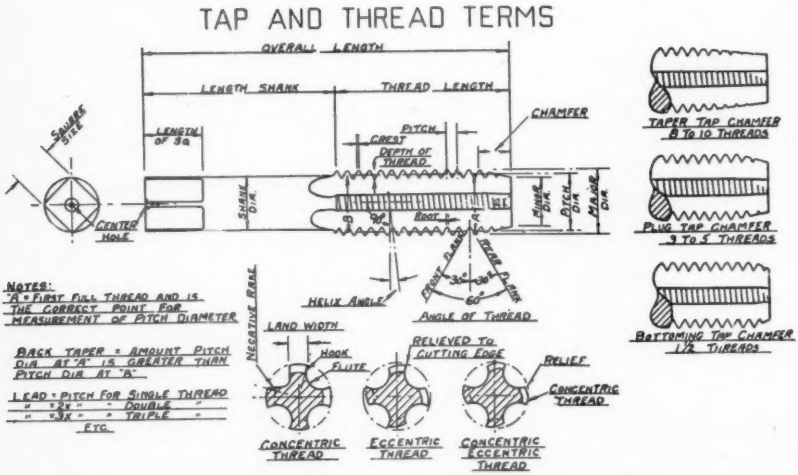
Fillers are used in thermosetting materials for the same purpose that plasticizers are used in thermoplastics. For example, general purpose phenolic plastics use wood flour in various amounts as a filler to improve the physical properties.

Pure phenolic resin is impractical to mold on the production basis because of its extreme brittleness after molding and the difficulties encountered in molding due to its low viscosity. In molding it would flow like water and leak or squirt through the smallest openings. The presence of wood flour thickens the material in molding and removes or reduces extreme brittleness of the molded product. The filler also lowers the material cost by its substitution for a considerable amount of resin.

Plasticizers and fillers will be discussed in detail later.

Practically all the thermoplastic materials are flexible and bend readily; at least all plastics of $\frac{1}{16}$" or more in thickness, which can readily be bent with the fingers, are definitely thermoplastic. Thermosetting materials, with the exception already noted, are decidedly rigid and not subject to bending. They crack and break if bent even slightly. It is possible to get some degree of flexibility in very thin sections of thermosetting materials by the use of a laminated cloth base. The cloth tends to prevent cracking or snapping in two but the resin itself does break up when bent too far.

The next article will be a brief survey of the 20 main plastics materials now available and will outline their outstanding characteristics.



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fied in order to offset inaccuracies in thread form and size.

Threaded parts that pass inspection immediately after tapping may sometimes fail to pass a later inspection. In one such occurrence, the aging effect of aluminum alloys, particularly as concerned parts with thin sections, was proved to alter the thread size. Inasmuch as heat treatment was not considered permissible, the trouble was overcome by allowing the pieces to remain idle for two or three days between machining and tapping operations.

Many job specifications call for anodizing after tapping. This does apparently change the size although it usually has little, if any, effect. If, however, the thread size is near the low limit it may be too tight to be acceptable. Hand tapping is the only remedy for saving such parts since machine tapping cannot be repeated.

Tapping Tips

1. Since a tap cuts and initially forms the thread by its end teeth, rather than along its entire "full thread" portion which serves largely as a guide, the shape of the end of the tap is most important. Be sure that flute, tooth face and land profiles are symmetrical and concentric. A good tap grinding machine is essential to accurate tapping.

2. When working aluminum, taps with four flutes usually produce better threads than those with two or three. The amount of metal that has to be removed per tooth is thereby reduced.

3. Taps with highly polished flutes cut cleaner threads. Polished flutes lessen both chip resistance and the danger of binding.

4. Spiral flutes work better in aluminum since they tend to lift the chips out of the hole.

5. Where thread lead is critical a tapping machine with a lead screw helps insure correct lead, especially in deep hole tapping. In aluminum there is less tendency for a tap to "pull itself in" and both lead and pitch may suffer if a lead screw is not used.

6. Taps without "back off" (eccentric relief) may work better in aluminum because the chips have less tendency to wedge and bind when backing the tap out of the work.

7. When gaging threaded holes be sure to remove burrs before inspection. A thread perfect as to form, pitch and size may be rejected if the gage is obstructed by a burr.

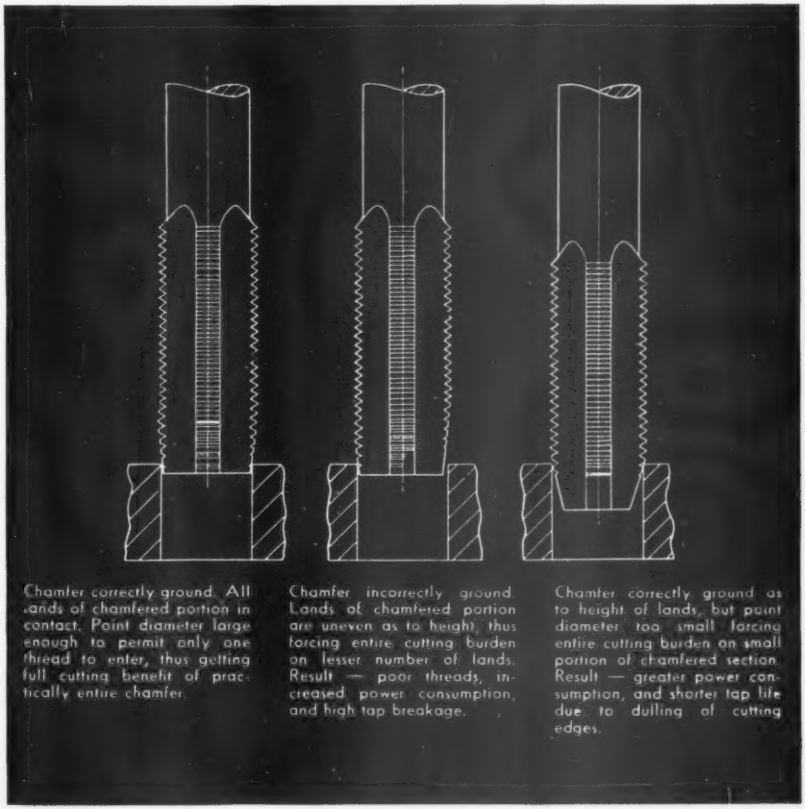
8. Guard against temperature differences when gaging widely spaced holes

Photo courtesy Henry P. Boggis & Co.

in aluminum. Consideration must be given to shop and inspection department temperature differentials when tolerances are close. Keep aluminum parts from cool drafts when making inspections. Keep inspection room temperature constant even if inspection and shop temperatures must differ. In addition to temperature control of inspection laboratory atmospheres, air filtering and humidity control will pay dividends, particularly in lessening the danger of rust.

9. Use the best taps procurable. Tell your tapping troubles to the tap manufacturer. His experience and knowledge can save you time and money.

HYBCO Chamfer Grinding Head. For tap chamfering, the tap is held in a collet as shown. The desired angle of chamfer is attained by swinging the head to the corresponding angular setting. Such a fixture insures that all lands will be sharpened with correct and uniform relief.



Chamfer correctly ground. All lands of chamfered portion in contact. Point diameter large enough to permit only one thread to enter, thus getting full cutting benefit of practically entire chamfer.

Chamfer incorrectly ground. Lands of chamfered portion are uneven as to height, thus forcing entire cutting burden on lesser number of lands. Result — poor threads, increased power consumption, and high tap breakage.

Chamfer correctly ground as to height of lands, but point diameter too small forcing entire cutting burden on small portion of chamfered section. Result — greater power consumption, and shorter tap life due to dulling of cutting edges.

(CONTINUED FROM PAGE 99)
has been to use speeds and feeds too low for adequate cutting performance. In the case of the aluminum bronze, the sfm should be near 250 and the feed should be near .017". Slower feeds and speeds merely tend to wear away the carbides by abrasive action.

The reason for the hollow ground side relief cannot be adequately explained by the writer in terms of force vectors and friction constants, but empirically it is the correct method of achieving this type of relief.

Hoping this letter and accompanying rough sketch will be of assistance to the boys in the shop having cut-off tool trouble, I am,

Very truly yours
Albert W. Ehlers

★ ★ ★

Gentlemen:

The following idea so effectively helped me solve an emergency problem that I believe it worth passing on for the benefit of your readers.

A few years ago I was confronted with a cutting-off problem very similar

SECOND PRIZE—$10 War Stamps (a Tie!)
Arthur F. Denkmann, Toolmaker
Pauly Jail Building Co., St. Louis, Mo.

to the cut-off operation described in your January issue of The Tool & Die Journal.

The material in the rough was a forged bar about 1½" diameter and about 10" long. I cannot recall the Rockwell test of this material, but I do remember that it was plenty tough for cemented carbide turning tools, and nothing seemed to stand up for a cut-off tool.

The first operation on this shaft was to chuck up in a Warner Swasey No. 3 turret lathe and face one end and center drill. Next the material was rechucked with live center supporting the end and turned to different dimensions along its length. Then came the "Brain Buster" of cutting it off.

After trying various commercial high-speed cutting tools and cemented carbide, etc., also tools of my own design and of various tool steels, the job was about to be given up for another more costly operation, when I asked my employer for certain materials with which to do the job.

My firm granted my requisition for some angles, bars, screws and bolts with which I designed a gadget or "Rube Goldberg" for the top and back of the gear housing of the lathe. To this I attached a tool post grinding attachment equipped with a 4" (Norton, if I recall right) rubber cut-off wheel. This was counterbalanced on the hanger at the back of the machine.

After the shaft was completely turned and ready for the cut-off operation it was very simple to lower the revolving cut-off wheel and feed through the finished shaft. Surprising, too, was the accuracy in length maintained by this method. Soluble oil was the coolant used both for the turning and cut-off.

I am quite certain that this method could be worked out on a hand or automatic screw machine. At the time I worked this out, I was employed as a turret lathe operator for a large manufacturer here in St. Louis.

I am sorry that I have not had time to go into more detail about this cutting-off method, also would like to have included a sketch, but didn't pick up the January issue of TDJ—a scarce item—until last week.

Trusting the information contained herein will be of some benefit to someone, I remain

Yours very truly
Arthur F. Denkmann

★ ★ ★

Dear Sir:

I regret being so late with my letter to your "Cutting-Off Problem" in the January edition of the Tool & Die Journal as it was given to me only this week. Will you permit me to address the following to the inquiring party?

SECOND PRIZE—$10 War Stamps (a Tie!)
Anton Staudacher, Die Shop Foreman
Dollin Corp., Irvington, N. J.

Gentlemen: Have you ever used a hacksaw for cutting off a revolving piece in the lathe? I have done it many times to save the time of setting a cutting-off

NEEDED BY OUR NAVY!
FORGING DIES
Some Large — Some Small
Some Tough — Some Easy
If You Can Produce Forging Dies
Please Contact:
C. A. HALL, Chief
Drop & Upset Forging Section
Steel Div. WPB, Room 1418 A
Soc. Sec. Bldg., Washington 25, D. C.

tool, and I advise my men to do so if there is danger of breaking the tool or spoiling the workpiece. Just think, on a hacksaw you have about 100 cutting teeth against one on a cutting-off tool. Before you do anything, try a 12" high speed blade, making about 20 to 25 strokes a minute over the revolving material. As a hacksaw blade is about .030" to .050" thick, it also saves you a lot of material.

My idea of using this method on a hand screw machine would be this: Mount a swing arm on the back of the lathe, like the arm on a Fox lathe for chasing a thread. On this arm, mount the guide for the saw so the proper length of cam roller will be cut. The stroke motion could be attained by hand or by a gear or belt drive from the end of the lathe spindle. Also a small motor with reducing gear drive could be installed to operate the saw. Care should be taken to secure an even feed into the revolving material in order to keep the cut concentric.

To use this method on an automatic screw machine, you can build a motor driven unit with a high speed circular slotting saw which also has 100 or more teeth. Similar slotting units are used on some automatic screw machines for slotting the screw heads. The speed of either saw should be slow, about 20 strokes or turns a minute, as the material revolves toward the teeth. A cam movement would feed the saw into the work. Using saws for cutting-off will be much less expensive than cut-off tools and will make much less waste. Cutting oil should be used to flush the chips.

I hope my short answer will be of help to the inquirer.

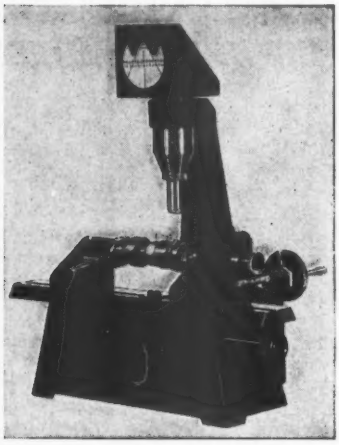
Yours truly,
Anton Staudacher

ACME THREAD PICK-UP PROJECTOR

The new Thread Pick-up Projector developed and recently introduced by the Acme Industrial Company of Chicago can be utilized to greatly increase the production of thread grinding operations. In addition to important economies in time and manpower, savings are effected in material per piece and by virtue of lessening the liability of scrapped work. At the same time, work quality is stepped up due to the assurance of uniform stock removal throughout the final grind.

The unit is an optical tool for presetting the driving dog on pre-threaded work, so that when such work is placed in the grinder the grinding wheel symmetrically enters the V of the oversize thread to uniformly remove finishing stock from both flanks without further adjustment.

For a given run of work, this relationship or pre-setting is attained in the following manner: A centered, plain blank is placed in the thread grinder and a short, shallow thread of the desired pitch is ground. This need not be to full form depth, but simply sufficient to produce a V a few thousandths deep. This brief operation fixes the relationship between the workpiece helix, driving dog, thread grinder positive center and master lead screw. The work and dog are removed from the grinder and placed between the centers of the Thread Pick-up Projector. The positive and variable centers of the projector can be alternated as to left or right in order to conform to the respective arrangement of the centers on the particular make of thread grinder being used. With the test piece thus properly between the projector centers, and with the driving dog resting on the projector dog supporting arm, the projector carriage is manipulated longitudinally and laterally to bring the test V into the beam of light. A final micrometer adjustment of the carriage quickly locates the projected shadow profile of the test V in coincidence with the master V profile ruled on the screen. The same relationship then exists between the projector positive center, driving dog, thread



helix and screen profile, as prevailed on the thread grinder between its positive center, the driving dog, thread helix and grinding wheel. In other words, the projector and thread grinder are in agreement, and production proceeds by placing a pre-cut workpiece, with its driving dog loosely engaged, between the projector centers. With the dog resting on the dog support, the work is rotated a half turn or less to bring its projected shadow profile into coincidence with the V on the screen. All that then remains is to tighten the drive dog, transfer the piece to the grinder and finish grind the thread. Carrying this procedure a step further, with the projector so "synchronized" with a thread grinder, a second thread grinder can be brought into agreement with both the first grinder and the projector. Thus one projector can be used for "assembling" workpieces and dogs for finish grinding in the two machines. Obviously, the two grinders must be of the same center arrangement. No time is lost in the pick-up operation since it is performed on each piece while the preceding piece is being ground.

An additional feature of the projector is the incorporating of means for tilting the optical axis assembly, comprising light source, condenser, objective lens, 45° reflecting plane and screen. This insures the projection of a geometrically true and most sharply defined profile of threads of either right or left hand helix. This adjustment, on either side of center or vertical, is calibrated and accurately repeatable.

Because the projector simplifies the operation of "picking up the thread" it becomes practical to follow the procedure: pre-cut—harden—finish grind. Grinding time is reduced because most stock has been removed by a screw machine or other high production means, and only one pass of the grinder will meet most production requirements. Wheel and diamond life are prolonged because the little stock removed does not require frequent dressing as in full depth grinding. Case hardening stock can be used instead of tool steel, and all portions of thread will be uniformly hard because the work was hardened after rough threading. Maximum hardness of case is retained since but a few thousandths of stock need be removed to clean up. Inspection of thread angle and root depth is made in the same setting by means of master rulings incorporated on the viewing screen.

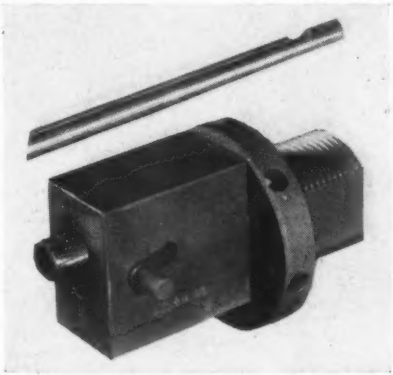
The projector is a rugged and accurate, special purpose, optical instrument, designed particularly for shop use. Its operation is of extreme simplicity and beginners are able to pick up the thread after but a few minutes instruction. It accommodates work up to 4½" diameter and 12" long, and will work in conjunction with any thread grinder. The screen is unusually brilliant, the projected image being clearly visible even in shops with the highest levels of illumination, hence no screen hood is required. The projector screen is ruled with a 60° V plus other graduations to indicate depth of root on American National Threads. Supplementary graduations on the same screen conform to Acme and Whitworth threads. Special screens for these thread forms and other profiles are also available.

Illustrated literature and specifications may be obtained by addressing the Acme Industrial Company, 206 North Lafiin Street, Chicago 7, Ill.

American Offers New Round Pin Type Broach Puller

A NEW Round Pin Type Broach Puller for either manual or automatic operation is the latest American Broach development for improved broaching operations. It is stated to be a great advance over pullers previously used for small broaches having round shanks of such small diameters that they could not be adapted to other types of standard broach pullers. The shanks of the broaches for use with this pull head have a half-round groove across the pulling end, as illustrated. While this type of shank has been used before, considerable time was lost in positioning the broach in the holder properly to permit the pin to be inserted and considerable clearance had to be provided on the old style inserted pin type pull head, which did not provide for positive positioning of the broach.

On the new American Round Pin Type Broach Pull Head the broach, when inserted into the head, is pushed in to a point where the pin will automatically slip into the notch. There is sufficient mechanical pressure back of the pin to seat it positively in the slot in the shank. This not only provides for a positive pulling means but also a positive radial positioning of the broach. This is a desirable feature, especially on small broaches where they must be positioned



in relation to the work. The broach can be inserted into the pull head and will be automatically connected and can be released at any time by pushing the cross pin with the thumb and forefinger. A slight pressure on this cross pin permits removal of the broach.

If it is desired to automatically release the broach, provision is made in a plunger just above the bore which receives the broach. This plunger is tapped and an adjusting screw is inserted and adjusted so as to come in contact with the reducing bushing so that upon the return stroke of the broaching machine the pressure on this screw causes the plunger to recede, releasing the cross pulling pin, at which time the broach can be removed without touching the pull head. This is desirable where the operator wishes to have the use of both hands during operations where the broach must be removed at each stroke.

When the broaching operation calls for a permanently locked broach, where it does not have to be removed from the pull head at the completion of each operation, the knock-off screw in the plunger is removed. This permits a positive permanent locking of the broach and in this case the broach is only withdrawn manually when it is desired to remove it from the machine.

American Broach & Machine Co., Ann Arbor, Mich., can furnish additional data. 708-I

Navy Reports 30 Plastics Applications

The Navy Department reports 30 applications of plastics to ship and combat articles to conserve on critical materials. These include: the surface lookout alidade, previously made of aluminum; the binnacle stand, changed to bonded plywood from brass; and bayonet scabbard, formerly made of leather. The plastics bayonet scabbard, being moisture resistant, is reported as much more satisfactory. Galley ware formerly made of stainless steel is now produced from plastics coated steel.

The U. S. Coast Guard has developed a plastics buoy, now undergoing service tests, which shows every indication of improvement over the former steel structure, particularly in weight reduction and corrosion resistance. Further development work promises even more decided improvement.

UTILIZATION OF TOOL STEEL TUBING FOR A BLANKING AND FORMING DIE

TOOL steel tubing has deservedly come into much wider use in die making since the beginning of the war because of its adaptability in reducing machining time, economy of metal stock and in speeding initial production. A very interesting single operation blanking and forming die, illustrated, is a good example of the utilization of various sizes of tool steel tubing to die construction.

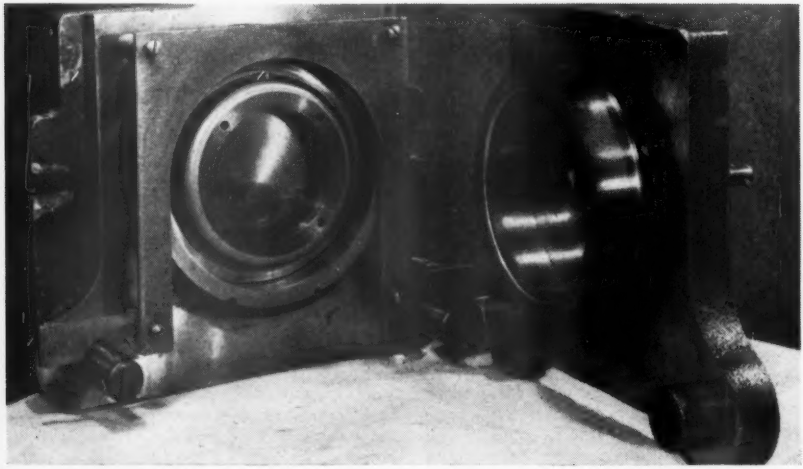
The die blanks and forms small heater tops out of 20 gage cold rolled sheet. Four sizes of tubing from 10" to 14" OD are used. The bottom (left in illustration) of the die utilizes three sizes: the layer or outer section of tubing is the blanking ring; the middle section is the pressure pad; and the inner section is the draw stake. The top (right in illustration) utilizes one section of tubing as a blanking and drawing ring. If tool steel tubing had not been used either one of two much more expensive and time-consuming methods would have to be used: the rings could have been forged to size and then machined; or solid bars could have been bored. The boring procedure would be the only alternate in smaller diameter deep draw dies.

The practice of boring solid tool steel bars to obtain a simple tubular part is very wasteful of stock to mention only one critical factor. To bore a 6" tool steel bar one foot long would mean that the equivalent of a 4" bar would have to be removed as scrap. At a cost of 40 cents per pound the waste in cost of material alone (estimating the weight of a 4" x 1" tool steel bar at 43 pounds) is $17.20. Of course, this is not even the major cost, since labor would ordinarily cost more, and the loss of time and manpower, the cost of machine power and maintenance, the cost of tool bits, setup time, etc., would all have to be added.

Tool steel tubing is particularly easy to use. The proper size of tubing is selected and sawed off at the desired length. Then the machining operations necessary to give the tube the contours required by the job makes the die parts ready for assembly in a die set.

Tool steel tubing is increasingly substituted for bored bars in the making of blanking dies, forming dies, punches, collets and collet closers, spindle and lead screw thread collars, rim rolls, and hardened ring gages, bushings, slitters, spacers, master tools, machine tool parts and a variety of other tools and parts.

For data on their line of tool steel tubing, write Bissett Steel Co., 945 E. 67th St., Cleveland, Ohio. 603-I

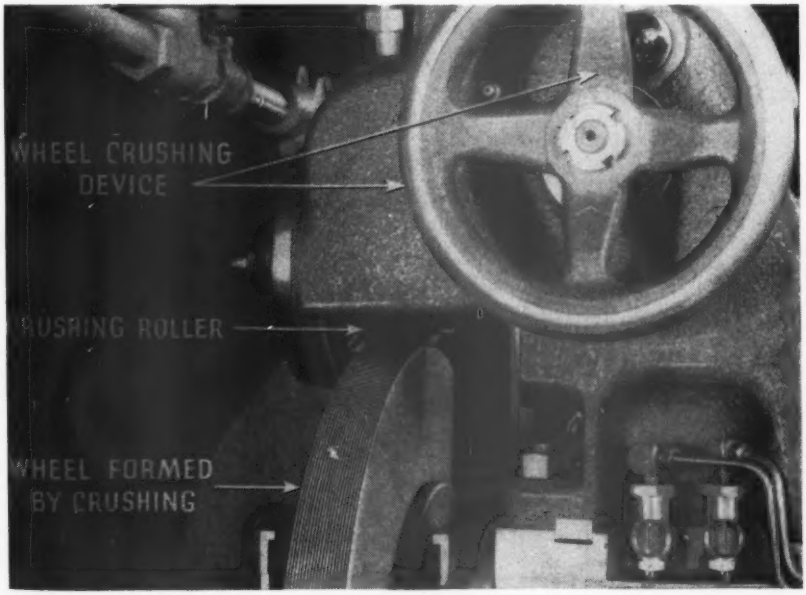


SHEFFIELD EMPLOYS CRUSHER ROLLER METHOD OF DRESSING WHEELS

The Sheffield Precision Thread Grinder is the first American designed thread grinder commercially available on which either a single-ribbed or multi-ribbed wheel may be employed, and it is finding a number of uses in precision gage work and straight production.

In addition to the conventional method of grinding threads to gage tolerances with a single-rib wheel, diamond dressed, a wide wheel may be dressed by this new crusher technique which will produce threads of sufficient accuracy for all production purposes by either traverse or plunge grinding. A multi-ribbed wheel, formed with a high speed steel crusher roll, plunge grinds threads to a class three fit. Irregular forms entirely apart from thread profiles are ground by using a wheel formed by an appropriately ground crusher.

The crusher roll method of dressing employs a hardened steel roller which has been accurately ground with a series of annular grooves of correct thread form or to any special form. It is engaged with the slowly rotating grinding wheel and, through what may be termed pressure milling action, the profile of the crusher roll is imparted to the wheel. The use of the hardened steel roller to dress the grinding wheel enables production to be greatly speeded up because much less time is required to crush a wheel than to profile it with a diamond. Compared with single point grinding, production of many parts can be stepped up approximately two to four times. Also, the method eliminates the use of diamond tools thus effecting a



The crusher roll method of dressing is clearly indicated. The ribs on the multi-ribbed grinding wheel are being dressed simultaneously.

(CONTINUED FROM PAGE 113)

savings in the cost of wheel dressing.

With the wheel crushing method of dressing, all the ribs on the multi-ribbed grinding wheel can be dressed simultaneously in less time than is taken to diamond dress a single-rib wheel. Since only a fractional part of the grinding load is carried by each rib of a multi-ribbed wheel, the multi-ribs retain their form longer and less frequent wheel dressings are required and many more parts can be produced per dressing.

In dressing the wheel the crushing roller is forced into the slowly rotating grinding wheel to the full thread depth and approximately ten revolutions of the grinding wheel complete the wheel forming and sizing operation, the entire operation taking but a minute or two.

In plunge thread grinding, the length of the thread is limited to the width of the wheel which is fed to full depth during approximately one-third of the revolution of the work head, and a fully threaded increment is completed in one pass, with the work making 1⅓ to 1½ turns. This results in a high rate of production and high quality. When plunge grinding other than thread forms, the wheel is fed full depth in one or more revolutions of the work head depending upon the profile.

Where the length of the threaded part exceeds the maximum allowable wheel width, it is possible to traverse grind up to a maximum of 8-inches length of thread. Different thread forms, of right or left hand, and up to 60 TPI, as well as many multiple threads are now being successfully ground in one pass with the multi-ribbed wheel. This method is opening up a new field to grinding where high production is of the first consideration and where fine finish and close tolerances are required.

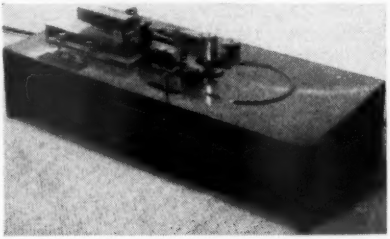
The Sheffield Corporation is an American pioneer in precision thread grinding, having built precision thread grinders for gage production in the first world war. Working with British concerns that produce similar equipment utilizing the crusher roll method of wheel dressing, Sheffield claims this method is producing outstanding results in greater efficiency, increased production and lower cost.

The Sheffield Corp., Dept TD, Dayton, Ohio will send full details. 24-I

NEEDED BY OUR NAVY!
FORGING DIES
Some Large—Some Small
Some Tough—Some Easy
If YOU Can Produce Forging Dies
Please Contact
C. A. Hall, Chief
Drop & Upset Forging Section
Steel Div., WPB, Room 1418A
Soc. Sec. Bldg., Washington 25, D. C.

Piston Ring Fixture for Profilometers

The side surfaces of all types of rings may be checked with the new Type R Fixture introduced by Physicists Research Company. Designed for production checking of surface-roughness of piston rings, it works in conjunction with any Profilometer. Rings may be measured by tracing circumferentially,



by tracing radially, or by a combined action. Rings are easily inserted and removed and very little adjustment is needed to handle rings varying from 2" to 10" OD. The same is true for keystone rings.

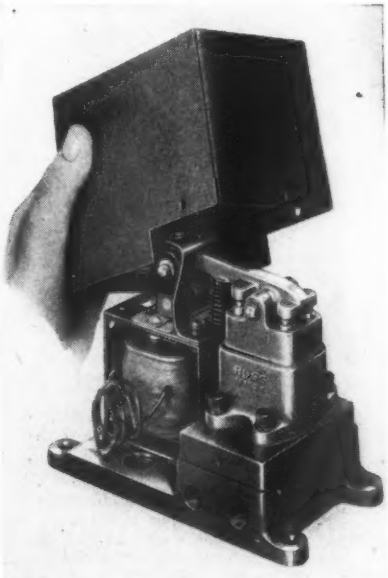
The operating cycle is wholly automatic and switches are provided for selecting the type of trace desired. As a protective measure the rotation of the ring automatically stops as the gap approaches the tracer diamond where damage might occur.

Write Physicists Research Co., Dept. T-9, 343 S. Main St., Ann Arbor, Mich., for details. 773-I

We have been informed by the Ace Abrasive Laboratories, One Spruce Street, New York 7, N. Y., that their "Star Dust" diamond powders are being used for the attainment of super finished surface qualities of less than .0000004 of an inch (.4 Micro-inch).

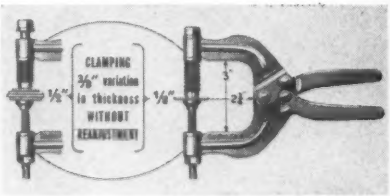
PROGRESS ON PARADE

NEW AIR CONTROL VALVE. A recent development of the Ross Operating Valve Co. is a compact solenoid air control valve which can be operated at sustained speeds up to as high as 400 reversals per minute. This model No. 835 is a ¼" heavy duty, solenoid-operated, four-way valve for the control of double-acting cylinders. By plugging one outlet, it may be used as a three-way valve.



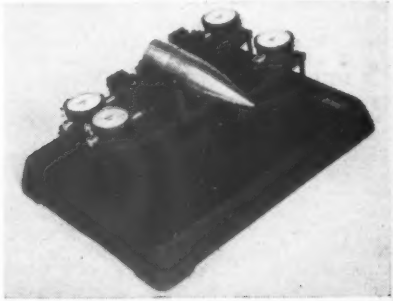
The valve is the same poppet type principle used by this company for the past 20 years. Overall dimensions of this model are: length, 7"; width, 3½"; and height, 5¼". Other features of the model No. 835 are its low consumption, noiseless operation and long life. For complete details write the ROSS OPERATING VALVE CO., 6482 Epworth Blvd., Detroit 10, Mich. **889-I**

PORTABLE TOGGLE CLAMP. This new De-Sta-Co No. 470 Portable Toggle Clamp has been especially recommended for use on sheet metal and where the individual parts to be clamped vary in thickness. A spring fitted onto one of the adjustment spindles provides a 3/8" variation in clamping thickness without readjusting the spindle. The 3"-wide



throat of the clamp enables it to handle a much greater than average range of work and the improved swivel foot permits angles and other odd shapes to be clamped securely. The gap for the thickness of the work is set by a thumb screw adjustment. Details on the No. 470 Portable Toggle Clamp may be obtained from the DETROIT STAMPING CO., 344 Midland Ave., Detroit 3, Mich. **165-I**

MULTIPLE INSPECTION GAGE. The Model 236 B-102 gage manufactured by Federal Products Corp., 1144 Eddy St., Providence 1, R. I., is entirely mechanical in construction and operation and checks inside and outside



diameters, various widths and lengths. In gaging shell diameters, for instance, the Model 236 B-102 simultaneously checks the base, the rotating band, the body and the start of the ogive. However, it can be built so that more or fewer diameters can be gaged if desired or it can be used in combination with another model (205 B) for checking the concentricity of shells and projectiles. Write to Federal for further information on this Multiple Inspection Gage. **4-I**

SQUARE TRUNNION BOX AND TRUCK. A new style trunnion box, square rather than round, has been announced by the PALMER-SHILE CO., 784 S. Harrington Ave., Detroit 17, Mich. The box, measuring 18" x 18" x 24", is made of 12 gauge steel plate, all welded construction and water tight, with steel plate reinforcing at trunnion. For handling these trunnion boxes, the manufacturer has also designed a truck of heavy bar stock. The truck has tubular handles and is of all-

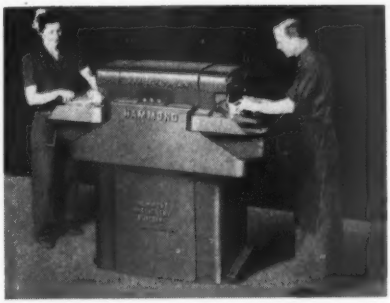
welded construction. The wheels (roller bearing) measure 10" x 2½". The operator pushes the trunnion truck to where forked side arm of truck engages trunnion, then by pushing down on the truck handles picks the box up off the floor and forms one unit of the box and truck for easy wheeling. One truck will handle a dozen or more boxes when used for hauling stock in storage or transporting work in process between operations. Full particulars will be sent on request. **421-I**

A NEW ROTARY MARKING MACHINE for the high production marking of machined components that can be rolled, is announced by the Acromark Company of 5-15 Morrell St., Elizabeth 4, New Jersey. Illustrated are a few examples of parts quickly marked with the new machine. Parts numbers, names, sizes and other data are rolled uniformly and, at the same time, deeply enough to permit a finish grind when required. Driving power is furnished by a 1½ hp gear reduction motor with extended shaft on which is mounted the marking roll. The oversize shaft is supported by massive pillar blocks with heavy roller or ball bearings to support the marking strain. A removable, transparent Lucite safety guard

covers the marking rolls. The new wedge type cradle rolls are controlled by a hand lever that brings the work into marking position against the continuous rotation of the marking roll. Due to the simplicity of design and manipulation this new machine lends itself to operation by relatively unskilled workers. **636-I**

WET-N-DRY CARBIDE TOOL GRINDER. The new coolant control feature of the Hammond 10" and 14" Carbide Tool Grinders provides the tool with proper flooding while grinding wet. Coolant spouts are adjustable and have wide outlets thus permitting the correct flushing of the work. Large splash pans around the work protect the operator and enhance free movement of the tool on the table. A

concealed, swivel, "no-splash" guard on the wheel closes one side of the cup wheel while the other side is in use, giving maximum visibility to the operator and complete freedom of motion of the tool around the working



area of the wheel. The wheel guard hood is easily removed, making wheel changes simple. Full particulars will be sent by Hammond Machinery Builders, Inc., 1631 Douglas Ave., Kalamazoo 54, Mich. on request. **95-I**

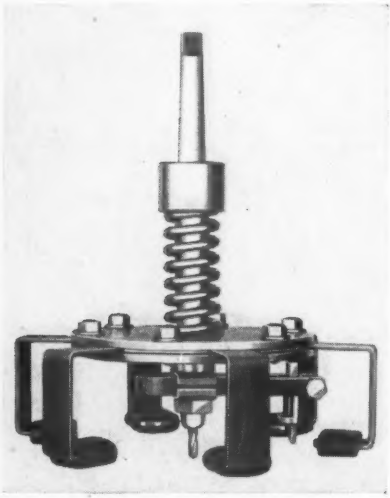
SHEET METAL SHEARS. One of the latest additions to foot operated sheet metal shears is the new Famco Foot Powered Squaring Shear. It is sturdily constructed of semi-steel, strategically reinforced and accurately machined. To assure accurate shearing with this machine, the crosshead is reinforced with a steel tie rod to maintain proper knife alignment. Compression springs are encased to practically

eliminate their breakage and the knives have high grade cutting tool edges capable of shearing up to 18 gauge mild steel. Back stops that traverse on heavy support rods by means of graduated racks and pinions provide fast and accurate depth setting. The Squaring Shear comes in five widths—22", 30", 36", 42" and 52". FAMCO MACHINE CO., Dept. T-3, Racine, Wis. **901-I**

GAP STYLE HYDRAULIC PRESS. The Reimuller Hy-Speed gap-style hydraulic press is designed to handle the many small press operations around the shop such as assembling, broaching, grooving, riveting, sizing, straightening, marking, forming, etc. The large area ram is hollow for receiving punches, dies, broaches and other tools and fixtures required in some pressing and broaching operations. Two levers are used in the hydraulic foot control, one for applying and the other for releasing the pressure. The unit is self air-eliminating and no bleeding is required. Entirely portable, this press can be quickly shifted to any machine or bench where needed. It is made in two models of 10 and 20-ton with 50% overload capacity. For full particulars write REIMULLER BROS. CO., 9404 Belmont Ave., Franklin Park, Ill. **902-I**

WORK-HOLDING CUTTING TOOL. A new, entirely different type of cutting tool has been developed by the Corlin Manufacturing Co. The tool is inserted in a drill press and, without the use of clamps, cuts circular holes from 1½" to 8" diameter in metal, plastics, wood, etc. The material is held at points close to the cutting circumference by adjustable legs, forced down by spring pressure thus preventing bulging and distortion in thin sheets. The extra heavy, radial "U"

beam slides between two channel type washers which positively prevents disturbing the setting once the nut is

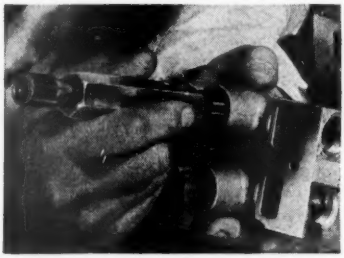


tightened. A heavy duty ball thrust-bearing carries the spring load. CORLIN MANUFACTURING CO., Dept. T, 3201 Clinton Ave., Minneapolis, Minn., will send more information. **900-I**

PRECISION GLASS SURFACE PLATES. A new type of master surface plate called "Opti-

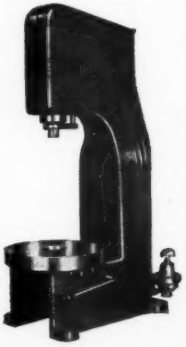
Flats" has recently been announced by BINSWANGER AND COMPANY, Precision Optics Division, Memphis, Tenn. These plates are said to be flat to 50/1,000,000 of an inch or less and are furnished in sizes of 12" diameter, 2" thick; and 16" diameter, 3" thick. Closer tolerances over complete surface are obtained by optical polishing. The coefficient of expansion is 280% lower than that of plate glass and 290% lower than cast iron, it is claimed. These plates eliminate rusting, warpage, degreasing, demagnetizing and oiling, and scratches do not affect the accuracy as there are no burs. Accuracy is checked optically by light interference. Write for more information on the "Opti-Flats". **918-I**

PIPE PLUG GAGES. The Vard pipe plug gages are available in three types: the L-1, a single notch working plug gage for checking the lead and minimum length of the thread on internally threaded pipe; the plain taper plug type for checking the minor diam-



eter and truncation of internal threads; and the 1-3 type for checking the thread form for major diameter of internal threads. These gages come in a full range of sizes from $\frac{1}{16}$" to 6" pipe diameters. VARD, INC., 2965 E. Colorado Blvd., Pasadena 8, Calif., will send complete data on request. **509-I**

AIR-HYDRAULIC PRESS. The new Model 900 Air-Hydraulic Press now being manufactured by the AIR-HYDRAULICS DIV. of the BEYER MACHINE CO., Dept. 3-T, Jackson, Mich., is simple and compact in construction. All of the working parts of this machine are contained in the housing and there are no cams, levers, pins or gears in the pressure mechanism. It is powered by a normal compressed air supply line which is multiplied by two hydraulic cylinders at a ratio of 50 to 1. The Model 800 is small enough for the lightest press job and yet powerful enough to handle many operations being done



on presses five times its weight. Simple adjustment of an air regulating valve assures positive control of pressure and the same even pressure in any position of the stroke. Predetermined pressure is always delivered regardless of varying thickness of the work piece. The company will send complete details on the Model 900 on request. **917-I**

LIFT-FRONT LENS HOLDER. A unique lift-front lens holder highlights a new line of welding helmets just introduced by Chicago Eye Shield Co. One feature is an arrangement whereby it may be used in a semi-open position which affords the operator a clear view of his work while protecting him from harmful flashes. The lens holder may also be opened a full ninety degrees. By streamlining, all pockets and cavities have been

eliminated from the outer surface thus preventing the accumulation of slag at these points. Smooth effortless operation of the door is due to reduced spring tension which also eliminates the "shock" and noise generally associated with a hinged lens holder. Light leakage is impossible because intermeshing beaded surfaces assure a positive "blacking-out" of light rays. The simplified lens springs make lens changing a quick and easy matter. For complete details write for circular LF, Chicago Eye Shield Co., 2310 Warren Blvd., Chicago 12, Ill. **851-I**

CUTTING OIL RECOVERY. Particularly timely during this period of oil conservation is the announcement by the Hilliard Corporation of a new cutting oil recovery plant for the extraction of oil from metal chips and for filtering and sterilizing the recovered oil. Fig. 1 shows a completely assembled cutting oil recovery plant while Fig. 2 illustrates how the chips are placed in the chip wringer (1) and the extracted oil flows into the accumulator tank (3) and then flows through the removable baffle screens. The motor driven pump (4 and 5) picks up the oil and forces it through the Hilco Hyflow Oil Filter (2). The Hilco is equipped with electric heaters and contains the filtering materials. When the oil is filtered clean and sterilized, it then passes to the clean oil tank (6). The dirty oil tank (7) is fitted with a flexible oil line and

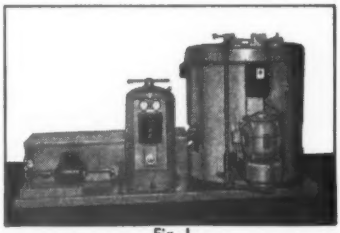


Fig. 1

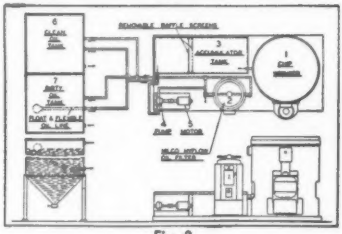
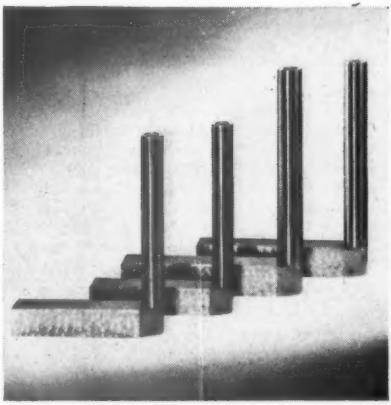


Fig. 2

float to decant oil from the surface, thus taking advantage of settling. Literature is available by writing the HILLIARD CORPORATION 404 West 4th St., Elmira, N. Y. **615-I**

PRECISION SQUARE. A new precision, toolmakers' square is now available from the THOMAS TOOL & MANUFACTURING CO.,



Dept. 3-TF, Pontiac, Mich., which, it is claimed, provides line contacts, greater checking range and constant accuracy. The Thomas square employs a hollow cylindrical column thus lessening the effects of temperature variations inherent in solid construction. As contact against the side of the cylindrical column is possible only at point of tangency, line accuracy is obtained. The square is constructed of materials that are stress relieved and heat treated to 60-64 Rockwell C hardness, and is available in 4", 6", 8", 10", 12", 14" and 16" sizes. A descriptive folder is available from the company. **489-I**

COLLET SPEED CHUCK. A new collet speed chuck for turning bar stock, facing off and second operation turning has been announced by ZAGAR TOOL, INC., 23880 Lakeland Blvd., Cleveland, O. Zagar Collet Speed Chucks are designed for use on screw machines, lathes and wherever collets are standard equipment. Face-off and length dimensions can be held within very close limits

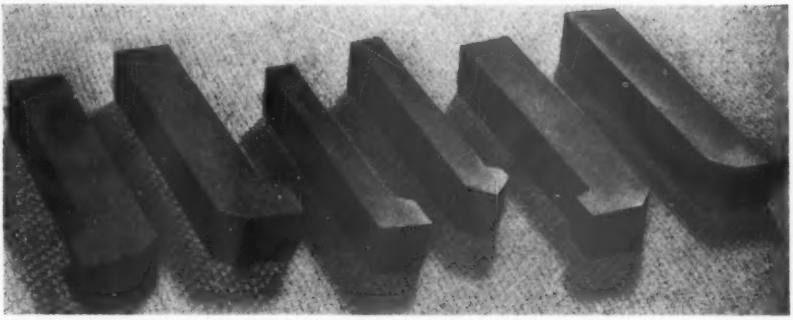
because in Zagar fixtures the collet does not displace horizontally in closing the jaws around the stock as is the case with practically all standard collet attachments. This collet speed chuck is independent of the spindle, thus it can be mounted on the face plate and can be indicated to run dead true regardless of any spindle run-out. It is available in 1" and 2" sizes. Complete data is available on request. 650-I

BUILT-IN COOLANT SYSTEM. A special coolant system designed for Rogers "Perfect 36" Vertical Turret Mills is now available on new mills and for installation on those already in operation. The system permits the delivery of two streams of coolant to the tool and the work through flexible tubing. The pumping unit, which is mounted on the base, is driven by a direct connected fractional horse-power motor and is self-contained, all enclosed and self-priming. The pump switch

is connected to the main switch, assuring positive coolant flow during all machining operations. The coolant flows back to the lowest point on the frame where it is picked up, cleaned and recirculated. For complete information, write ROGERS MACHINE WORKS, INC., 127 Arthur St., Buffalo 7, N. Y. **446-I**

A NEW COUNTERSINK, having a micro-set stop of unusually simplified construction and of compact size, is announced by Aircraft Tools, Inc. Having one-third the number of parts usually found in countersinks this new Aircraft Tools model is said to offer many exclusive features such as split collet type shaft which allows the use of various cutters and pilots, full ball thrust bearing that eliminates heat and friction, simplified positive sight adjustment in increments of .002", lock spring in sight adjusting sleeve that holds locking teeth in set position, pin that positively locks stop collar to shaft and is vibration-proof and has permanent lubrication reservoir. A spring loaded spindle retracts cutter back into stop cage for safety to operator and materials thus protecting cutting edge of tool and increasing the life of the cutter. Its bell shape design eliminates any tendency to rock. Address the company at 750 E. Gage, Los Angeles 1, Calif. **178-I**

Prove their Superiority By this FREE TRIAL!



Several hundred machine shops engaged in important war work are demonstrating every day that Victory Tool Shanks with cemented carbide tips out perform and outlast high-speed steel tools.

We invite you to prove the truth of this statement for yourself, by a trial in your own shop.

HERE'S HOW:

Write for our Bulletin No. 53T-2 which illustrates standard shapes and sizes of Victory Tool Shanks stocked for immediate shipment. Pick out two or three that you can use. Ask for them for free trial. We'll ship at once and let you be the judge.

You, too, will find that these tough Meehanite Shanks work better and last longer than steel, and cost you less.

THE Cooper-Bessemer CORPORATION
DEPT. J., MOUNT VERNON, OHIO

Acoustics Control and Work Efficiency

The problem of controlling acoustics—particularly in noise levels which are distracting or detrimental to the efficiency of workers on precision parts, machines or instruments—is one that is receiving a good deal of attention in manufacturing plants as well as in the precision industry shops. It has been found that acoustics control is an important factor in gage making and inspection, in delicate parts production and assembly and in the over-all efficiency of workers, particularly those not accustomed to high or irregular, discordant noise levels.

Sound, a form of energy, once generated and set in motion, must go on and on until it is absorbed by natural resistance. Sound travels in the form of waves at an average speed of 1120 feet per second. Striking obstacles—walls, windows, machines, other moving metallic equipment like stock, work parts in process or completed—sound will turn back, reflect or bounce, flow around the obstacle or be absorbed. In a shop where many tools are running, most noise will turn back with very little energy absorbed.

In the gage inspection rooms, for example, noise must be kept at the lowest possible level. In larger shops the construction of the building may make it difficult to provide initially for acoustics control.

The efficient way to reduce noise is to absorb it. Special acoustical materials provide for effective sound absorption by a high porosity. By specifying porosity and thickness of the material various degrees of absorption are obtained.

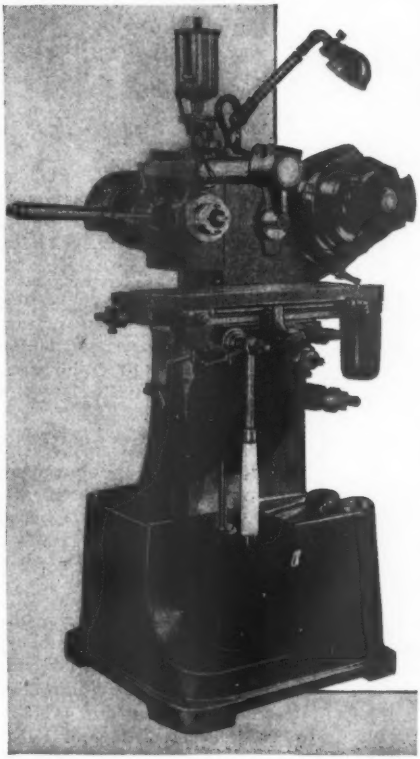
By placing sound conditioning materials such as Acousti-Celotex on the ceilings and walls a far greater portion of sound energy is absorbed. The most commonly used acoustical materials are those manufactured in tile form. Such tile can be made to a uniform absorption, are easily installed and have many possibilities of combination and arrangement for pleasing design and decorative effect. Certain types, characterized by small surface perforations, may be painted without injury to their sound absorption properties.

"Wartime Program of the Apprentice - Training Service"

Just how the Apprentice-Training Service, Bureau of Training, War Manpower Commission, is assisting industry to meet its manpower needs through both short-term training and apprenticeship systems, is outlined in an eight-page review, "The Wartime Program of the Apprentice-Training Service." The review, reprinted from *Personnel*, the publication of the American Management Association, was written by William F. Patterson, Director of the A-TS. In the review Mr. Patterson explains the various types of training programs which have been established in war industries with the assistance of A-TS representatives. He describes the basic standards and provisions of short-term systems so developed; and also how apprenticeship plans have been adjusted to meet war conditions, including the employment as apprentices of those least apt to be called for military service: older men than usually accepted for long range training; youths in the 16 and 17-year-old groups; women in some cases, and—of increasing importance—returning veterans. A copy of this review is available upon request to the above Bureau of Training, WMC, Washington, D. C.

"Power Press Protection"

The third printing of the 16-page booklet "Power Press Protection" has been issued by Junkin Safety Appliance Co., Inc., Louisville, Ky. The common defects and causes of accidents with power or stamping presses are pointed out—the author, John I. Junkin, maintaining that 97 percent of all press accidents can be traced to man failure. Brakes, clutches, press speeds, non-repeating devices and feeding methods are treated briefly but clearly. The four types of commercially built guards: automatic interlocking gate guards, sweep guards, pull-out devices and two hand grips are described. The importance of inspection and supervision of a safety program is emphasized. Features of the Junkin Guard are given briefly. The Junkin Company will supply copies of the booklet on request. 343-I



Nichols Millers

WITH RISE-AND-FALL SPINDLE

Where can you find the equal of the Nichols Miller in versatility of production and precision operation? Besides conventional milling, the Nichols Miller performs dozens of unusual operations *to tolerances in tenths.* Rise-and-fall spindle arrangement and a full line of attachments make the Nichols especially adaptable for production, toolroom or laboratory. WORKING SURFACE: 6¾" x 21", or 6¾" x 30". RANGE: Longitudinal 10" or 19"; Transverse 7"; Vertical-Knee 13½"; Spindle Rise-and-Fall 4½". STANDARD SPEEDS: to 2400 RPM. SPECIAL SPEEDS: to 5000 RPM.

MANUFACTURED BY

W. H. NICHOLS AND SONS

WALTHAM, MASS.

TODAY'S MULTI-PURPOSE PRODUCERS

- √ Keyseat Milling
- √ Profiling
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WPB Labor-Management Exposition

The War Production Board sponsored the first National Labor-Management Production Exposition in the Department of Commerce Auditorium, Washington, D. C., from Friday, March 3, to Saturday, March 11. Donald M. Nelson, WPB Chairman, invited Government, Military, War Agency, diplomatic, industry and labor officials. Open to the public, the Exposition included movies, dioramas and dramatic war output exhibits to illustrate the cooperation of labor and management in more than 4,000 war plants that keep supplies going to combat areas all over the world.

Labor-management committees of 72 plants participated as exhibitors in the exposition arranged through WPB's War Production Drive.

The companies whose labor-management committees participated as exhibitors included: Allis-Chalmers Manufacturing Co.; Aluminum Company of America; American Optical Co.; American Smelting & Refining Co.; American Type Founders, Inc.; Anaconda Copper Mining Co.; Bath Iron Works Corporation; Bell Aircraft Corporation; Blaw-Knox Co.; Bridgeport Brass Co.; Bristol Co.; Buffalo Arms Corporation; Buffalo Council (representing several committees); Caterpillar Tractor Co.; Chapman Valve Manufacturing Co.; Cleveland Pneumatic Tool Co.; Colonial Beacon Oil Co.; Connecticut Telephone & Electric Co.; Coppus Engineering Corporation; Crown Fastener Corporation; Curtiss-Wright Corporation; Cushman Chuck Co.; Cutler-Hammer Inc.; Dallas Tank & Welding Co.; Douglas Aircraft Co., Inc.; Electric Auto-Lite Co.; Electric Boat Co.; Emerson Electric Co.; Fellows Gear Shaper Co.; Firestone Tire & Rubber Co.; Freed Radio Corporation; General Motors Corporation; Glenn L. Martin Co.; Goodyear Tire & Rubber Co.; Greenfield Tap & Die Corporation; International Business Machines Corp.; International Harvester Co.; Kaiser Co., Inc.; Kearney & Trecker Corporation; Leland Electric Co.; Manning, Maxwell & Moore, Inc.; Marinship Corporation; Minneapolis-Honeywell Regulator Co.; Murray Corporation; Naval Air Materials Center, Philadelphia Navy Yard; Newark Council (representing several committees); New England Shipbuilding Corp.; North American Aviation, Inc.; Northern Industrial Chemical Co.; Northrop Aircraft, Inc.; Norton Co.; Packard Motor Car Co.; Pollak Manufacturing Co.; Pratt, Read & Co., Inc.; Pratt & Whitney, Inc.; Radio Corporation of America; Raybestos-Manhattan, Inc.; Simplex Wire & Cable Co.; Star Electric Motor Co.; Sterling Engine Co.; Teletype Corporation; Thompson Aircraft Products Co.; United States Cartridge Co.; United States Rubber Co.; Walter Kidde & Co., Inc.; Weber Showcase & Fixture Co.; Western Cartridge Co.; Western Electric Co.; Westinghouse Electric & Manufacturing Co.; White-Rodgers Electric Co.; Winchester Repeating Arms Co.; Worthington Pump & Machinery Corp.

Atlas of Isothermal Transformation Diagram

Fifty-six diagrams, so-called "S-Curves", have been brought together in the new Atlas of Isothermal Transformation Diagrams published by the United States Steel Corporation, Kearny, N. J. Each "S-Curve" rep-

resents the time of response of a particular steel to specified conditions of temperature. It serves as a guide to the proper treatment of these steels.

The booklet, which will be distributed to war material producers who are users of steel, to metallurgists and technologists in industrial and educational laboratories, and to others interested, has been termed a significant contribution by U. S. Steel to the science and practice of ferrous metallurgy.

In the practical heat treatment of steel, as ordinarily conducted, the steel is first heated to a temperature higher than its so-called transformation temperature at which the carbon goes into solution, and then it is cooled in some specified way, as by quenching in water or oil, or allowing it to cool slowly in the furnace. In this process the step which most significantly influences the properties developed in the steel is the initial rate of cooling, which is a matter of both temperature and time; because of this the results are difficult to interpret usefully in general terms. This difficulty can be obviated by separating the effects of temperature from those of time at temperature; and this separation is the fundamental idea on which these diagrams are based.

Each set of observations shows the sequence of events when the previously heated steel is not cooled continuously, but quenched to a certain temperature level and held there; and the diagram summarizes the results of such constant-temperature or isothermal transformation over the range of ordinary heat treating conditions. Publication of these diagrams from time to time in individual articles and papers has resulted in their widespread use by metallurgists, heat treaters and welding engineers. The collection in this atlas was designed to meet the considerable demand for the diagrams of a large number of steels, by reproducing them in a form and size convenient for practical use.

The fifty-six diagrams included in the booklet represent a total of 47 different compositions selected from a larger group for which information was available. They are grouped in seven sections with each group preceded by a few remarks pertinent to it. The sections are separated by standard charts in blank, inserted for the convenience of those who may wish to construct a diagram from other data. The booklet also contains editorial material on the significance of the isothermal transformation of a steel, explanation of a typical diagram, and a selected bibliography.

War and Post-War Industrial Standards

The current (December 1943) issue of *Industrial Standardization*, publication of the American Standards Association, contains two articles of considerable interest to manufacturers, large and small.

In "Trends in Standardization" ASA Secretary P. G. Agnew points out that industrial standards are rapidly increasing in importance, both in our own economic and industrial life and on an international scale. To Lend-Lease he attributes the comparatively new international aspect of industrial standards, which is leading to the establishment of a United Nations Standards Committee, to have offices in London and New York or Washington. The need for this may be seen in the great volume of American aircraft and electronic, optical and ordnance products which have been sent overseas, and in embryonic plans to industrialize many regions of the world, such as China. The war, of course, has greatly increased interest in standards in this country, causing many organizations, technical and trade associations and nearly all war agencies to adopt and follow standardization technique.

The importance of standards will continue to grow in the post-war era and will be of vast importance in reconverting production machinery to peacetime purposes. The main handicap which has prevented some small plants from participating more fully in war production has been their difficulty in following approved standards.

Of special significance today is the reference to standards in advertising and the greater recognition of them on the part of the public since price controls of the OPA have been in effect. Agnew discusses the trend toward certification of products and quality control.

In concluding he cites the development of standards as a factor which will help keep industry free of political control, since the application of engineering or scientific methods can solve many problems faced by industry better than can political methods. Notable examples are the Building Code Standards, Traffic and Safety Standards and codes for the prevention of industrial disease.

The other article referred to, "What Role for Standards in Post-War Production," by L. F. Adams and L. P. Alger of General Electric, may be considered an amplification and supplementation of the same subject. The meaning of standards is defined as the adherence to accurately specified processes, sizes, qualities and tests of materials and equipment that have become generally agreed upon by both makers and users. Proper application of standards will provide more goods at lower cost, with fewer materials and less time, and would consequently spread employment and raise living standards. The authors, however, warn against a too rigid adherence to standards lest standards become an end in themselves. Rather they should be used as norms which will readily allow improvements.

A Tonic for the Ill of Unemployment

Speaking as retiring president of the American Physical Society, Dr. Albert W. Hull, assistant director of the General Electric Research Laboratory, stated that physical science can provide a tonic for the ill of unemployment. He said that "this tonic is new products. New products are resistant to depression psychology, and experience has shown that they can be sold when old products can't. In this way, physicists can contribute to the all-important job situation."

Though pure research, "that is, research whose aim is to obtain knowledge rather than make something," is a proper public expenditure, since its results go to everybody, Dr. Hull expressed the belief that industry would share in it, "as a contribution to knowledge, in partial payment for the values it receives from the research of others."

On the other hand, he continued, "government-financed development of new products, though necessary in war, is so un-American as to be unthinkable in peacetime. For it is in just this field of new development that private initiative is most efficient, while government, though an effective agent for furnishing the common services that have become standardized, is very unsuited to operations which require initiative and judgment."

Dr. Hull compared the development of physics in the United States during the present war with that of chemistry in World War I. "Hence," he continued, "physics may expect a post-war popularity comparable with that which chemistry enjoyed in the twenties.

Recent U. S. Patents

Among recently issued U. S. Patents the following are of Tooling interest. If you are interested in studying any of these Patents, simply advise "Patent Information Service", The Tool & Die Journal, 2460 Fairmount Blvd., Cleveland 6, Ohio, enclosing 20 cents for each Patent desired and we will gladly forward your order to Washington.

MANDREL FOR HONING MACHINES, No. 2,336,043.
QUICK-CHANGE CHUCK, No. 2,336,095.
METHOD FOR FINISHING METAL PARTS, No. 2,336,145.
SCREW ROLLING DIE, No. 2,336,190.
RELIEVING ATTACHMENT FOR MACHINE TOOLS, No. 2,336,201.
RELIEVING ATTACHMENT FOR MACHINE TOOLS, No. 2,336,202.
STRIPPER FOR MOLDING PRESSES, No. 2,336,212.
PRESSING MECHANISM, No. 2,336,262.
LOCKING SPRING FOR DIE HOLDER, No. 2,336,325.
MEANS FOR ADJUSTING PRESS GIBS, No. 2,336,351.
DEPTH GAUGE, No. 2,336,393.
METAL STAMPING DIE, No. 2,337,127.
HONING DEVICE, No. 2,337,183.
MACHINE TOOL TRANSMISSION AND CONTROL MECHANISM, No. 2,337,223.
METHOD OF PRODUCING GEARS, No. 2,337,228.
GAUGING TOOL, No. 2,337,248.
WHEEL DRESSING TOOL, No. 2,337,249.
CHUCK MECHANISM, No. 2,337,312.
COMBINED SQUARE AND COMPASS, No. 2,337,315.
CUTTING TOOL HAVING TIP OR INSERT OF TUNGSTEN CARBIDE OR LIKE HARD MATERIALS, No. 2,337,322.
FLANGING TOOL, No. 2,337,342.
TOOLHOLDING DEVICE, No. 2,337,400.
DRILL CHUCK, No. 2,337,402.
MICROMETRIC TOOLHOLDER, No. 2,337,412.
COLLET CHUCK, No. 2,337,471.
MICROMETER GAUGE, No. 2,337,509.
LATHE TOOLING MECHANISM, No. 2,337,530.
DIE CASTING-PLASTIC INJECTION METHOD OF MOLDING, No. 2,337,550.
TOOL HOLDER, No. 2,337,663.

LET THEM HELP YOU

These technical articles, in reprint form, contain valuable information and instruction for tooling and production men.

BROACHING TECHNIQUE—Covers broach types and designs—internal and external broaching—broach maintenance and sharpening—broaching machine design, vertical, horizontal, push and pull. 16 pages. Price 20c

THREADING TECHNIQUE—Explains tap and thread terms—how to get longer tap life—types of taps and tapping machines and holding devices—tapping various materials—tapping speeds—sharpeping taps—trouble shooting check list. 16 pages. Price 20c

WELDING TECHNIQUE—Treats are welding—carbon arc—metallic arc—shielded arc. Explains arc crater and length—joints and welding positions—padding—distortion—troubles and cures. 16 pages. Price 20c

CONTOUR MACHINING TECHNIQUE—Details on saw selection—butt welding—correct saw tracking—angle and internal sawing—speeds—"Do's" and "Don'ts". 16 pages. Price ...20c

PLANING AND SHAPING TECHNIQUE—Thoroughly covers planing, shaping, and slotting—the correct grinding of the cutting tools—work holding fixtures—tool chatter—7 tables on tool design, speeds and feeds. 16 pages. Price..20c

INSPECTION TECHNIQUE—Detailing inspection methods, tools and equipment—tolerance control charts explain bilateral and unilateral tolerances. 8 pages. Price 20c

THREAD GRINDING TECHNIQUE—Thread grinding machines and methods—wheel selection and care—wheel dressing to thread profile—wheel speeds—work speeds—cutting depth. Troubles and cures. 8 pages. Price 20c

DRILLING TECHNIQUE—Data covering selection and use of drills for various materials—fractional, number, decimal and metric drill size charts—spark tests—trouble shooting check charts. 16 pages. Price 20c

CARBIDE TOOLS IN WAR WORK—An authentic discussion of carbide tools in war production—stressing tools for shell turning—covers reclamation of used tools. 6 pages. Price ..10c

SURFACE FINISH INSPECTION ON THE BRUSH SURFACE ANALYZER—A thorough, engineering coverage of surface characteristics, specifications and inspection. 12 pages. Price 15c

DRILLING AND TAPPING CAST STEEL—A series of 25 "still" pictures with captions reproduced from a USOE training film. Covers drilling and tapping blind holes on a radial drill. Price 10c

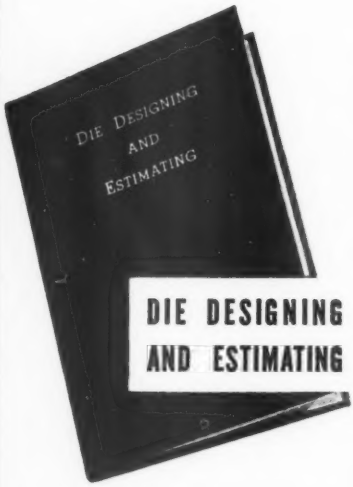
FLAME HARDENING STEEL DIES—A development prolonging die life. Covers application of flame hardening to the tool and die industry. Price 10c

FACTS ABOUT CHROMIUM FOR THE TOOLMAKER—Written specifically for tool and die men—covers hardness and thickness of plating and action of chromium on machining and stamping tools. Price 10c

METALLIZING IS SAVING VITAL WAR MATERIALS—Provides information on processes and applications—covers salvaging—preparation of work by rough threading and sand-blasting—electric bonding and spraying. Price 15c

PRACTICAL POINTS IN MOLD DESIGN AND CONSTRUCTION—Details 149 factors that improve mold design—construction—includes compression and injection molds. Valuable data for plastics finisher, designer and production man. Price 10c

INFRA-RED IN INDUSTRY—Describes infra-red heating systems and applications—shrinkage and expansion of metals—combination of heating and freezing—tables. Price 15c



Prepare now for competitive conditions which will resume with retooling for peace goods production. Demand for metal stampings will automatically bring the need for all types of dies.

This second edition of Die Designing and Estimating contains fundamental data on design by specialists in the die making and metal stamping industries.

The estimating section describes the original Dannes method which constitutes the only published, successful method for pre-determining costs of special dies according to semi-standard formulas. 160 pages—125 drawings, graphs and photographs—31 estimating tables—150 practical points on die design and cost determination. Price $3.00 per copy plus postage.

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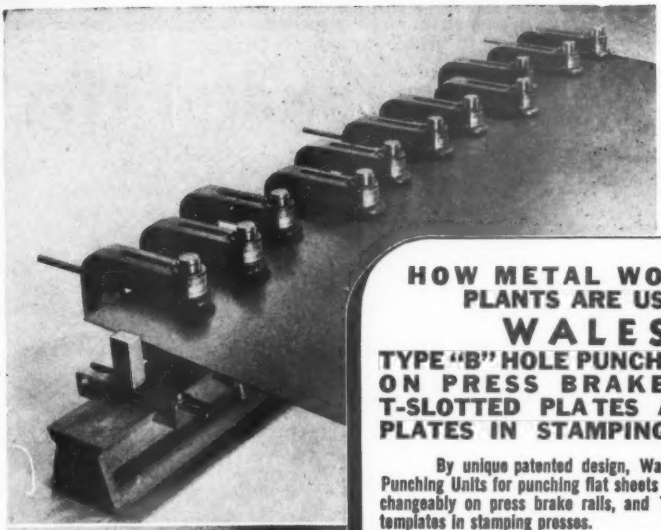
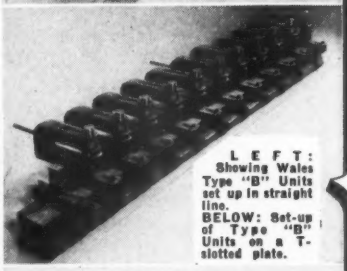
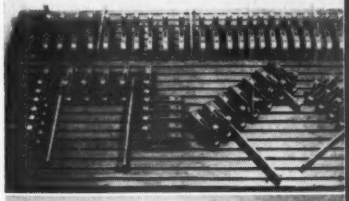
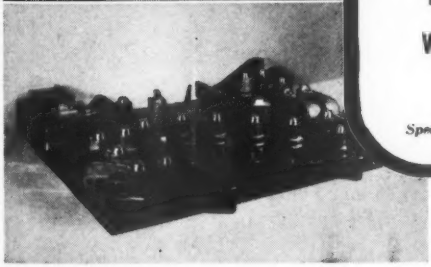


Showing staggered pattern set-up for punching holes in sheets on press brakes. This is made possible by Wales Adjustable Adapters.



LEFT: Showing Wales Type "B" Units set up in straight line.
BELOW: Set-up of Type "B" Units on a T-slotted plate.





Template set-up of Type "B" Hole Punching Units for stamping presses.

HOW METAL WORKING PLANTS ARE USING

WALES

TYPE "B" HOLE PUNCHING UNITS ON PRESS BRAKE RAILS, T-SLOTTED PLATES AND TEMPLATES IN STAMPING PRESSES

By unique patented design, Wales Type "B" Hole Punching Units for punching flat sheets can be used interchangeably on press brake rails, and T-slotted plates or templates in stamping presses.

Set-ups on T-slotted plates and templates are quickly made by simply bolting the units in exact position according to master pattern. Each unit is independent and self-contained with punch and die held in constant alignment by holder. This makes it possible to set the units in any location on plates. Units are easily moved or replaced in set-ups so they can be used and reused to eliminate costly "dead storage."

For press brake set-ups these units are clamped on Wales adapters which are clamped to Wales press brake rail. The adapters are designed for front to back adjustment to provide staggered as well as straight line hole patterns.

Other time-saving, money-saving features built into Wales Type "B" Hole Punching Units:—

Nothing is attached to press ram...punch and die holder is a self-contained unit...punch and die are always in perfect alignment eliminating the usual time-consuming adjustments required to line up punches and dies of conventional set-ups...interchangeable punches and dies to punch various sizes and shapes with same holders...die setting time and press "down time" are cut from hours to minutes.

"There's Always Something New in the Wales Line."
Keep posted by writing for Catalog "B."

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Specialists in Punching and Notching Equipment

THE *Center* OF LONGEST LIFE

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MARVEL IS NOW MARVECO

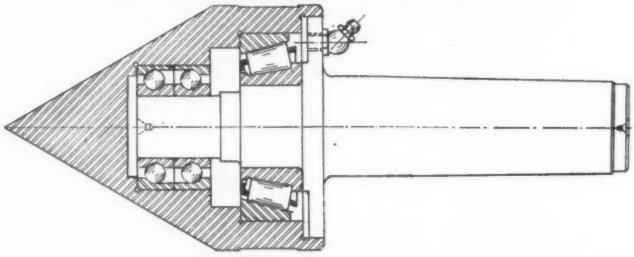
The Marveco Live Center (formerly Marvel) retains the same features and patented construction — a combination of precision Taper Roller and Ball Bearings with a completely automatic adjustment for wear — that makes possible the guarantee that Marveco will outperform any other live center.

Its ability to hold limits indefinitely makes the Marveco one of the very few live centers to be recommended for grinders. A pair of Marvecos when checked recently had run for eleven months on a 20mm gun barrel with runouts of .0001" and .0002".

The Marveco's ability to stand heavy loads and high speeds is a proven answer to the adaptation of Carbide cutting tools in the modern plant.

The new Marveco Live Center Catalog will be sent on request.

CUTAWAY VIEW SHOWING MARVECO CONSTRUCTION



You get these results with Marveco: 1. Unheard of accuracy; 2. Elimination of chatter, center regrinds and scrap due to inaccurate or worn centers; 3. Undivided attention of operator to work; 4. Increased production due to heavier cuts obtainable with the Marveco.

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PUBLICATION PREVIEWS

SALES AND TECHNICAL LITERATURE

Send Request on Company Letterhead

GORDON'S METALLURGICAL CATALOG—of unusual interest are the detailed pages dealing with the numerous Gordon-built special metallurgical equipment. Several pages are devoted to Gordon's original metallurgical X-ray inspection laboratary. Metallurgical laboratory supplies, many of which are manufactured or distributed exclusively by Gordon, are also featured, with other pages describing their different plants, offices and laboratories, which are "all strategically located to serve the great metallurgical heart of America". The catalog points out how the Gordon organization has helped to keep heavy units of war production running at high speed in World War I, and again in World War II. The lessons, learned in the former, are proving of inestimable value to Gordon clients during the latter. Copies may be secured from the CLAUD S. GORDON CO., Dept. T, 3000 S. Wallace St., Chcago, Ill. **759-I**

SIL-FOS AND EASY-FLO—the low temperature silver brazing alloys which are free-flowing at 1300° F and 1175° F respectively have proved important factors in helping industry hit its objectives in the production of guns. Easy-Flo is employed on gun work where ferrous metals are the rule and Sil-Fos brazes only non-ferrous metals. Easy-Flo and Sil-Fos are used in shipyards, airplane factories, in plants making shells and tanks and all kinds of equipment in which metals are joined. Further information, illustrated applications, and case histories may be had by writing to HANDY & HARMAN, 82 Fulton St., N. Y. 7, N. Y. for Bulletin 12-A. **310-I**

GEMCO MULTI-PURPOSE CRANK SHAPERS are equipped with a circulating forced feed lubricating system, and with the Lubrigard, an automatic safety device preventing the operation of the ram in case of deficiency of the lubricating system. These shapers are available in three types: Plain, Production, and Universal, and in various sizes. All these types and sizes have, with minor exceptions, a wide range of feeding mechanism, powerful ram with extra large sliding surfaces and bearings, flood lubricated transmission gears, twin type bull gear, mechanical self cleaning filter, oil pressure piping to all principal bearing surfaces and visible oil feeding stations. Further information is available from GENERAL ENGINEERING & MFG. CO., Dept. D, 1523 S. Tenth St., St. Louis, Mo. **850-I**

"PEDRICK" BENDING MACHINES are presented in an interesting 12-page folder issued by the PEDRICK TOOL & MACHINE CO., INC., Dept. J, 3638-42 N. Lawrence St., Philadelphia, Pa. Contained in this folder is an article on "The Art of Bending" which briefly discusses all the present day types of bending including those of various other companies so that the prospective buyer can select the type of equipment best suited to his needs. Excellent suggestions on the selection of a machine are included. This Bending Machine is designed so that almost nothing can happen to injure it or the operator as long as the limit switches are not removed. Also included are fully illustrated and detailed descriptions of the characteristics and capacities of the various compression process bending machines which they manufacture. **847-I**

ILLUMINATORS & INSPECTION UNITS which reduce worker fatigue and relieve eyestrain are important factors in the battle of production. Acrolite inspection units illuminate and magnify at the same time and are equipped with fluorescent bulbs that give a soft, glareless light without heat or shadows. The Acro Die Cradle is a work supporting, parallel, unit that provides an easier, more accurate machining set-up for drilling, counterboring, tapping, milling and grinding. Another machine shop helper by Acro is their Master Grinding Gauge which positions the tool at the proper angles while being ground on any type of surface grinder. Illustrated and detailed information is available from ACRO TOOL & DIE WKS., Dept. J, 4892 N. Clark St., Chicago, Ill. **595-I**

"CORRECT DRILL POINTING" is the title of an interesting and helpful 12-page booklet issued by the CHICAGO-LATROBE TWIST DRILL WKS., Dept. TD, 411 W. Ontario St., Chicago 10, Ill. This booklet emphasizes that if a drill is accidentally allowed to get

too hot during grinding, it should never be cooled suddenly in cold water, but should be allowed to cool slowly as a sudden cooling is almost sure to result in a cracked drill. When re-pointing a drill, lip-clearance, point-angle, cutting edges and point-thinning must all be carefully and exactly executed. This information is also contained in their Catalog No. 39 along with technical data including tables and dimensions of drills, countersinks, reamers and miscellaneous tools. **567-I**

PRODUCTO HAND TAPPING MACHINE embodies a number of desirable improvements to accommodate a wide variety of uses and applications. Holes can be tapped or reamed at any point in the work within the area of the table on the machine. This table is drilled and tapped on the center line to permit work to be bolted or clamped to the table. Four radial slots projecting from the center are used for disposing of the chips produced from the tapping operation. Further information is available from the PRODUCTO MACHINE CO., Dept. J, 990 Housatonic Ave., Bridgeport, Conn. **91-I**

HOLDEN NEUTRAL BATHS for hardening and tempering is the subject of a well-presented 26-page booklet published by the A. F. HOLDEN CO., manufacturers of heat treating baths and pot furnaces, Dept. K, New Haven 8, Conn. Neutral baths are compounds of properly selected chemicals designed to provide molten heating mediums that are inert to the work, will neither carburize nor decarburize, that are stable and which will operate 600° F above their melting points. **150-I**

TAPPING MACHINES—Facts about the line of "Kaufman Hi-Duty" tapping machines are presented in Bulletin No. 828 issued by L. J. KAUFMAN MFG. CO., Dept. J, Manitowoc, Wis. Principles of operation, special features, pictures of single and dual spindle tappers, special machines and fixtures, and complete specifications are included. **865-I**

INDUSTRIAL CLUTCHES including the Single Revolution Clutch, which is completely automatic for intermittent and positive drive; the Friction Clutch and Friction Cut-off Coupling with extended sleeves, made for use with pulleys, sheaves, gears or sprocket wheels; the Centrifugal Clutch, simple in construction, fully adjustable and completely automatic; and the fully automatic Over-Running Clutch with dual drives, ratchets and two speed drives, are all described and illustrated in a group of bulletins published by the HILLIARD CORP., Dept. T, Elmira, N. Y. **615-I**

ELECTRIC GRINDERS AND BUFFERS are illustrated and described in Catalog 60, published by the HISEY-WOLF MACHINE CO., Dept TD, Cincinnati 25, Ohio. The motors of all Wide Range Precision Grinders are given a special laboratory dynamic balance and are ball bearing equipped. Grinding heads together with

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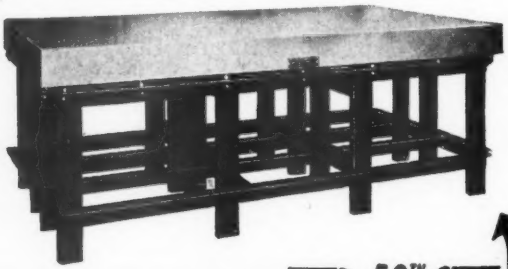
LAYOUT SURFACE PLATES

When you require a smooth, true, rigid surface for layout, inspection or assembly work Challenge Layout Surface Plates will do the job . . . . and do it well!



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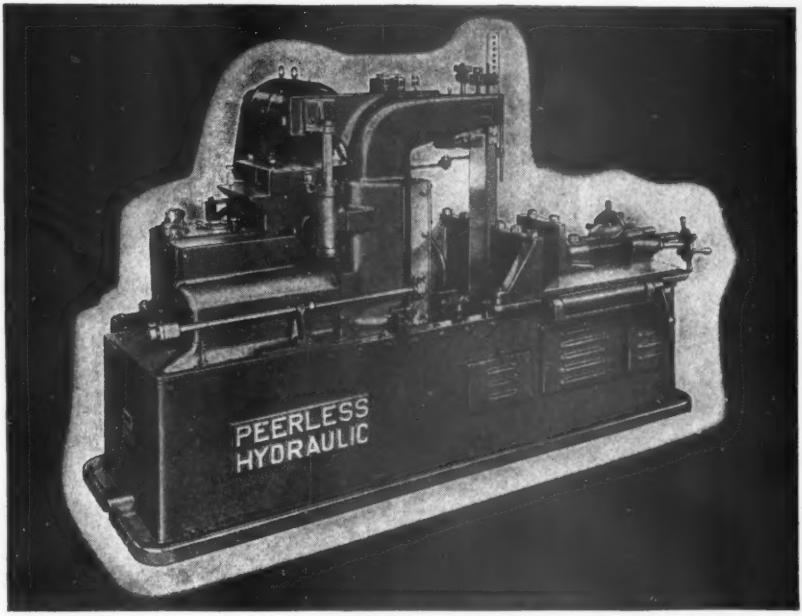

Salvage WORN Die Blocks!

WORN die blocks can be re-cut with the Peerless Vertical Metal Cutting Saw. It has no equal for slotting and slitting. Tool and die makers use scrap pieces for smaller dies, strippers and stripper plates when they have the Peerless Vertical. It cuts square and true all through. Only a few thousandths need be allowed for planing. This is the *only* hydraulically controlled metal cutting saw that will handle 10 x 24 in. stock without turning the work. Easily loaded by crane. Mail the coupon for estimate of cutting time on your toughest operation and full details of the Peerless Vertical.

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Builders of Fine Tools for Thirty Years . . . Acro-matic Grinders . . . Hydraulic Pumps . . . Blades . . . Coolant . . . Special Machinery

PEERLESS MACHINE CO., Dept. TDJ-344, Racine, Wis.

- ☐ Mail catalog on Hydra-Cut Saw for High Production Cutting
- ☐ Mail catalog covering Vertical type used for Die Block Work
- ☐ Mail catalog on Mechanical type Saw for production cutting
- ☐ Mail catalog on general utility and maintenance Saws

Company_____

Individual_____

Street_____

City_____ State_____

the motor can be swung end for end so that grinding can be done either to the right or left of the machine. Wheel can be operated in either direction of rotation. **542-I**

DEMAGNETIZERS & ETCHERS are described and illustrated in a 4-page leaflet issued by GRINDING MACHINERY TOOL & SUPPLY CO., Dept. J, 10226 Woodward Ave., Detroit, Mich. There are six Red "E" models to choose from, all of them are portable and will operate from any 110 volt, 60 cycle, A. C. outlet. Also manufactured by the company are compound angle magnetic chucks which are most essential in grinding tungsten carbide tools, circular form tools, lathe tools, crankshaft tools, thread chasers, sectional broaches and others. **654-I**

AUTOMATIC CUT-OFF MACHINE for cutting non-ferrous metals is illustrated and described in a bulletin issued by the CONSOLIDATED MACHINERY & SUPPLY CO., LTD., Dept. TD, 2029-33 Santa Fe Ave., Los Angeles, Calif. Standard equipment includes 5 HP, 3 phase 220/440 volt 1800 RPM motor and magnetic starter with push button control which is located conveniently for the operator. Motor drive to jack shaft is by multiple Vee belts. The table of this 1400 lb. machine is a heavy, ribbed, semi-steel casting, 28" x 28", with an accurately machined working surface 11" x 28." It has a deep coolant trough around the entire table edge with built-in, screened, coolant return. The table is mounted on a heavy, pressed steel cabinet with door at rear. **845-I**

HOT WAX DIPPING—Based on the logical theory that the efficiency of the protective coating depends upon the wax and the efficiency of the Hot Dip Tank, the AEROIL BURNER CO., INC., Dept. T, West New York, N. J., has issued a new Bulletin, No. 268, on a complete range of new models of Hot Wax Dipping equipment. Also included are specifications of fixed installations and portable units which the manufacturer claims will provide safer and faster hot wax heating without discoloration or rejects. **776-I**

ELK UNIVERSAL TOOLHOLDER which may be employed on all lathe operations is illustrated in a folder issued by ELK TOOLS, INC., Dept. TD, 33 W. 60th St., N. Y. C. Right and left hand facing, turning and threading, as well as boring and cutting off operations that formerly required several different holders, can be done with this Universal Toolholder. Once the holder is set up, the bit can be removed for regrinding and can be replaced without resetting the holder in the toolpost. Because of the horizontal position of the bit, only a small clearance angle at the cutting edge is required. This prevents bit breakage and is one of the reasons why carbide tools can be used to advantage in the Elk holder. **852-I**

• On this one machine you can lap and polish—quickly, precisely—a wide variety of small metal and plastics parts, each at its most efficient finishing speed! • Schauer Ideal Variable Speed Lathes provide a wide range of spindle speeds—in a ratio of 11 to 1 with a two-speed motor, or 6 to 1 with a single-speed. Write for Catalog 440, showing and describing various models and sizes.

SCHAUER MACHINE COMPANY

ORIGINATORS OF TODAY'S SPEED LATHES

2078 READING ROAD ··· CINCINNATI 2, OHIO

YOU COULDN'T ASK FOR ANYTHING MORE SIMPLE — OR BETTER THAN

WHISTLER ADJUSTABLE PUNCH and DIE UNITS

Whistler Adjustable Dies work on any type press and because of their simplicity even new workers quickly learn to make pattern change-overs—increasing productive press hours. Absolute precision on short or long runs. Whistler design permits more perforations in a given area—often reducing press operations.

For quick and complete information on the advantages of Whistler Adjustable perforating and notching dies send a description or drawing of your work.

These pieces produced with Whistler Adjustable Dies clearly illustrate the re-use of same punch and die units.

These photographs show the simplicity of a Whistler Adjustable Punch and Die assembly. Every piece is interchangeable.

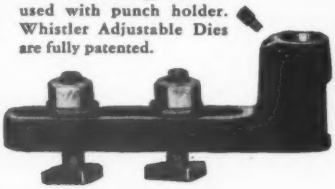
Self-locking bolts on punch holder drop into T slots of die shoe. Set-screw engages into recess at base of punch. Punch cannot turn or pull out in operation.

Punches of finest tool steel are machined to .0001" tolerances.

Stripper unit fits smoothly over punch—no "wobble". Flushed set-screw engages into groove on punch body. Stripper or punch quickly removed when desired.

Grooved heads on dies make lifting from holder quick and easy. Like the punches, dies are held firmly into holder by set-screw in recess at base. Whistler *precision* is known the world over.

Die holder has self-cleaning slug chute. Special design bolt heads present two bearing surfaces to T slot channel—self-locking, same as used with punch holder. Whistler Adjustable Dies are fully patented.



Write for the Whistler Catalog—every Production Executive should have it.

S. B. WHISTLER & SONS, Inc.

Over 25 Years of Tool and Die Making Experience

752-756 MILITARY ROAD BUFFALO, N. Y.

PUBLICATION REVIEWS

BAND FILING to precision tolerances with the DoAll Band Filer is illustrated in a 4-page bulletin issued by CONTINENTAL MACHINES, INC., Dept. T, 1301 S. Washington Ave., Minneapolis 4, Minn. Important information on "file broaching" operations on metals, wood and plastics is given. Chips are cut —metal removed—nine times faster than by the most energetic hand filing and four times faster than by conventional reciprocal machine filing. **696-I**

CCA FILTERS which remove sludge, dust, sand, oil, rust scale and moisture from compressed air lines are described in a 4-page leaflet issued by FILTERS, INC., Dept. TD, 1515 Gardena Ave., Glendale, Calif. These filters are used to protect air tools from clogging; to eliminate water and oil emulsions from paint spraying; to prevent "rejects" caused by rust and the sand-blasting effect of dirt and moisture blown on fine machine-tool parts; to provide dry air for the cleaning of coils, instruments and delicate parts used in aircraft assembly and to remove water from tamping tools in foundries. **292-I**

HARD FACING ALLOYS AND OVERLAY METALS are described and illustrated in Catalog No. 75 just released by the WALL-COLMONOY CORP., Dept. TJ, 720 Fisher Bldg., Detroit 2, Mich. Colmonoy Sweat-on Paste has the greatest abrasion resistance of all Colmony hard-facing materials and outwears ordinary hard metals several times. This metallic hard-facing paste, compounded with a suitable flux binder which does not deteriorate through drying, can be brought back to its original consistency by the addition of water. **849-I**

"UNIVERSAL" 3-WAY ANGLE-SET VISES reduce set-up time, "modernize" single-purpose machines, step up production with standard tools, and put discarded machines back to work relates a 6-page circular issued by the UNIVERSAL VISE & TOOL CO., 33 Frank St., Parma, Mich. This vise holds work rigidly for milling, drilling, boring, reaming, grinding, shaping, die sinking, checking—in fact for any operation on or off a machine tool involving either single or compound angles. It is ideal for grinding complex toolbit shapes —for drilling holes at hard-to-get-at angles—for milling tool blanks for carbide inserts, etc. **7-I**

SUTTONITE HIGH-SPEED STEEL WELDING RODS is the subject of a six-page leaflet issued by WELDING EQUIPMENT & SUPPLY CO., Dept. D, 223 Leib St., Detroit, Mich. Suttonite No. 1 and No. 2 are used to effect repairs by the oxy-acetylene welding method, to teeth and flutes of milling cutters, broaches, drills, ball and end mills, reamers, taps, cutting tools for lathe, planer and shaper, and special shape forming tools. In addition, tool life can be prolonged by building up areas that are worn or ground below requisite sizes. **580-I**

"STEEL IN THE MAK ING" is the title of an

A NON-FERROUS HIGH SPEED CUTTING ALLOY WITH THESE ADVANTAGES:

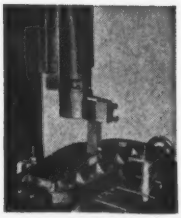
- **Hardness at high temperature**
- **Superior abrasion resistance**
- **Superior resistance to impact**
- **Freedom from chipping**
- **Available in solid tools or inserts**
- **Requires no change in equipment**

Write for catalog and prices.

CROBALT INC.
ANN ARBOR, MICH.

DOUGLAS *Precision* MACHINES

The Douglas Precision Slotter is adaptable to both tool room and production work. Swiveling ram head with tool holder and rotary table often solves the problem of costly fixtures. Automatic feeds in all directions—7" to 10" stroke.

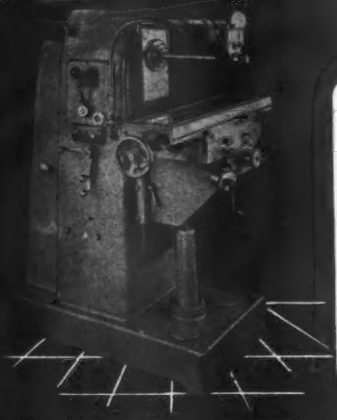


Typical production parts machined on a Douglas Slotter.

FOR TOOL ROOM AND PRODUCTION

Prompt Delivery

The Douglas Miller combines rigid, well balanced design with convenience of control, making it particularly suitable for accurate work in tool room as well as for general production.



Showing operation with Universal Milling attachment on tool room job producing a production fixture.

Showing operation with four cutters machining alloy steel for high precision aircraft parts.

DOUGLAS MACHINERY CO., Inc.

150 BROADWAY • NEW YORK, N. Y.

PUBLICATION REVIEWS

extremely interesting and well presented non-technical treatise describing the fundamentals of steelmaking, published by BETHLEHEM STEEL CO., Dept. TD, Bethlehem, Pa. The three methods of making steel—the open-hearth process, the bessemer process and the electric-furnace process—are explained. Nine pages are devoted to definitions of some terms used in the steel industry. In a most interesting manner is shown how the physical properties of steel are improved by hot mechanical working which is carried out by one of three methods, rolling, hammering, or pressing. Further information on this along with excellent photographs and clear and concise explanations and diagrams are presented throughout the booklet. **903-I**

SUPER TWENTY SHAPER—embodying the latest developments in shaper design, the 20" Queen City Shaper is readily adaptable to a wide variety of machine shop work and equally suited to heavy and general tool room work. Its feed range affords a fine feed of .008" for finishing and a hogging feed of .191" for the heaviest roughing. In machining an irregular surface, it is not necessary to disengage the feed in order to apply the power rapid traverse. Further information is contained in a 4-page leaflet issued by QUEEN CITY MACHINE TOOL CO., Dept. J, 217 E. Second St., Cncinnati 2, Ohio. **888-I**

"VAPOCARB-HUMP METHOD for Heat-Treatment of Steel" is the title of a 36-page catalog, T-621, issued by LEEDS & NORTHRUP CO., Dept. D, 4934 Stenton Ave., Philadelphia 44, Pa. The three controls embodied in Vapocarb-Hump furnace equipment—Vapocarb control of atmosphere, automatic control of rate-of-heating and hump control of quench point—provide three important advantages: little or no refinishing, negligible rejections, long average tool life. The steel is guarded from abnormal stress, and hardening losses due to warpage and breakage are reduced to a minimum. **360-I**

WILLEY'S NO. 710—a new cutting grade of Carbide—has just been announced by WILLEY'S CARBIDE TOOL CO., Dept. T, 1340 W. Vernor Highway, Detroit 1, Mich. This new metal is claimed to be far superior to any steel cutting grades now on the market for machining tough alloy steels. This company has just published a new bulletin, No. 144, showing their latest prices on Willey's metal and tools. **551-I**

SPEED CASE & SPEED TREAT PLATE is the title of Catalog No. 1234 issued by W. J. HOLLIDAY & CO., Dept. J, Speed Case Plate Div., Hammond, Ind. Speed Case is the fastest machining open hearth steel plate made. Fine or coarse cuts can be made without tearing, much machining is done without resorting to the use of cutting oils and there is no breaking off of short chips thus leaving a roughened surface—a condition common to most types of steel. The use of Speed Treat steel for

ACCURATE REPRODUCTION
...with Matthews
Safe-Hed*- Tuf-Face*
STEEL STAMPS & MARKING DIES
Trade marks . . . trade names . . . special lettering or designs . . . accurately reproduced in Matthews dies and stamps . . . for marking all types of industrial products. Stamps and dies furnished for hand stamping, or for use in presses or marking machines.
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Branch Plants
New York, Boston, Chicago, Philadelphia, Newark, Syracuse
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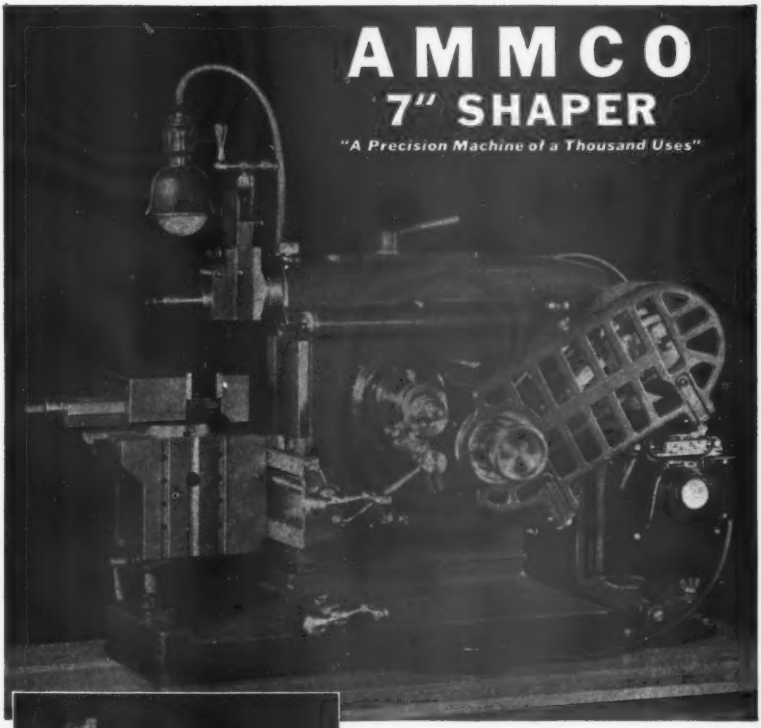
AMMCO
7" SHAPER
"A Precision Machine of a Thousand Uses"



IT'S PORTABLE

- **Saves time and steps!**
- **Can be moved from job to job in tool and die shop!**
- **Just wheel up to bench--plug in--and go to work!**

On jobs requiring a stroke of 7" or less, the AMMCO 7" PRECISION SHAPER will enable you to save a lot of time and expense in a set-up which would be required for larger shapers. Furthermore, the AMMCO will enable you to get away from the cost of operating a big shaper on small work.

Portable Cabinet model enables this shaper to be moved about the shop.

•

Write today for specifications and prices

AUTOMOTIVE MAINTENANCE MACHINERY CO.
2100 Commonwealth Ave.—North Chicago, Illinois, U. S. A.

induction hardening and selected surface hardening has contributed to alloy conservation. **312-I**

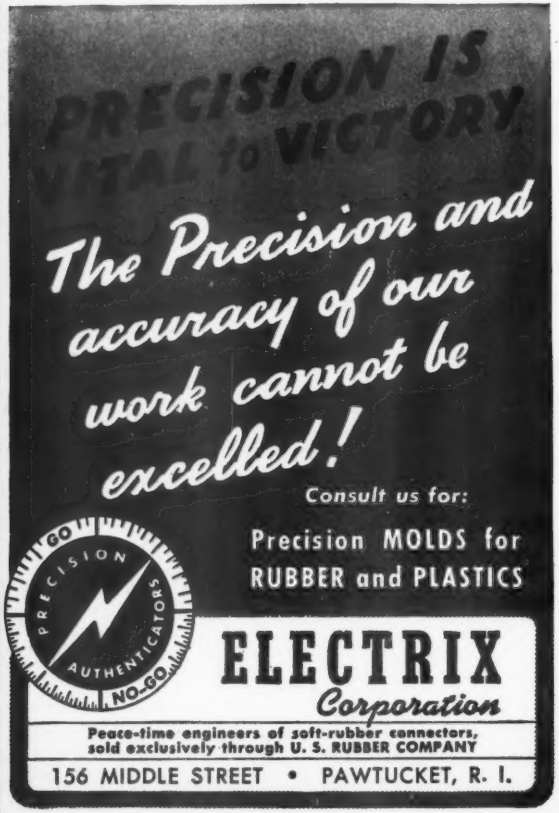
RIVETING TOOLS and equipment are presented in a new illustrated catalog announced by the EMERSON ENGINEERING CO., Dept. T, 1418 S. Flower St., Los Angeles 15, Calif., designers and manufacturers of precison products. Divided into sections and indexed for customers' ready reference, is information on Rivet Sets, Squeezer Sets, Dimpling Tools, Bucking Bars, the new Hi-Shear Riveting Tools, and General Riveting. **883-I**

THREAD MILLING CUTTER BLANKS for thread milling cutters, carried in stock ready for thread grinding to users' specifications, are listed in a four-color technical and descriptive bulletin, CB-43, just made available by DETROIT TAP & TOOL CO., Dept. D, 8432 Butler Ave., Detroit 11, Mich. Both shell type and shank type with three standard types of tapers are included. Any special or standard thread form with or without plain milling sections may be specified. Reference to this bulletin simplifies ordering, eliminates special cutter design and enables faster delivery of most thread milling cutters. **134-I**

ONSRUD MACHINES—their complete line of nonferrous metal and woodworking machines, tools and cutters is presented in a new and interesting pocket-size catalog issued by ONSRUD MACHINE WKS., INC., 3941 Palmer St., Chicago 47, Ill., pioneer designers and manufacturers of Air Turbine and High Cycle Electric Tools and machines. The Onsrud Tilting Spindle Shaper is one machine that can do everything that is done on conventional shapers plus many jobs not generally considered within the capacity of such machines. Spindle lubrication is provided by Onsrud's patented "Metered Mist" centrifugal force feed system. Extension tables may be had to give the 6' table a length of 12'. **836-I**

CARBIDE TOOLS—single-point, diamond-ground—are the theme of a 4-page stock tool bulletin, No. 44-1, released by TUNGSTEN CARBIDE TOOL CO., Dept. J, 2661 Joy Rd., Detroit 6, Mich. Six styles of single-point tools, four of which are available in both left and right hand types, including offset tools are featured. Complete specifications of all tools carried in stock are listed along with prices that show a sharp reduction over those current in 1943. **887-I**

RUBBER CUSHIONED ABRASIVES—prices and dimension tables on Brightboy wheels and rods for use on grinders, lathes, presses and polishing machines, and on Brightboy blocks with flat and curved surfaces for metal parts to be worked by hand—are contained in a comprehensive catalog issued by the WELDON ROBERTS RUBBER CO., Dept. J, Newark, N. J. Speed tables and other helpful production information are included. A specially-prepared "Methods and Applications" leaflet outlining various production procedures and


PRECISION IS VITAL to VICTORY
The Precision and accuracy of our work cannot be excelled!
Consult us for:
Precision MOLDS for RUBBER and PLASTICS
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AUTHENTICATORS
NO-GO
ELECTRIX
Corporation
Peace-time engineers of soft-rubber connectors, sold exclusively through U. S. RUBBER COMPANY
156 MIDDLE STREET • PAWTUCKET, R. I.

SAVE PRODUCTION TIME

with a SHOPLIFTER

One man can handle heavy dies alone. Not necessary to stop other machines to get help.

MORE production per day from your machines if a Shoplifter is handy to do the heavy job of moving dies from storage racks to the press. In these times when maximum production of machines is of vital importance, much time and labor can be saved if the operator can handle the heavy work of changing dies without calling for help from other operators.

The Shoplifter is built for this job. Dependable and safe with a rated capacity of 500 lbs. (heavier machines up to 5000 lbs. can be furnished). Entire machine built of structural steel. Electrically welded throughout. Platform lifts 54" above floor and lowers to within 5½" of floor. Overall height 72". Size of platform 24"x24" wood deck. Crank, up and down, hoist unit.

ECONOMY ENGINEERING CO.
2659 W. Van Buren St., Chicago, Ill.

Price **$147.50**

IMMEDIATE DELIVERY

short cuts is also available. Each of these pieces of literature describes the advantages which resilient rubber Brightboy abrasives contribute toward achieving superior results in de-burring, finishing, polishing and close tolerance work at substantial savings in time and at marked improvement in product quality. **668-I**

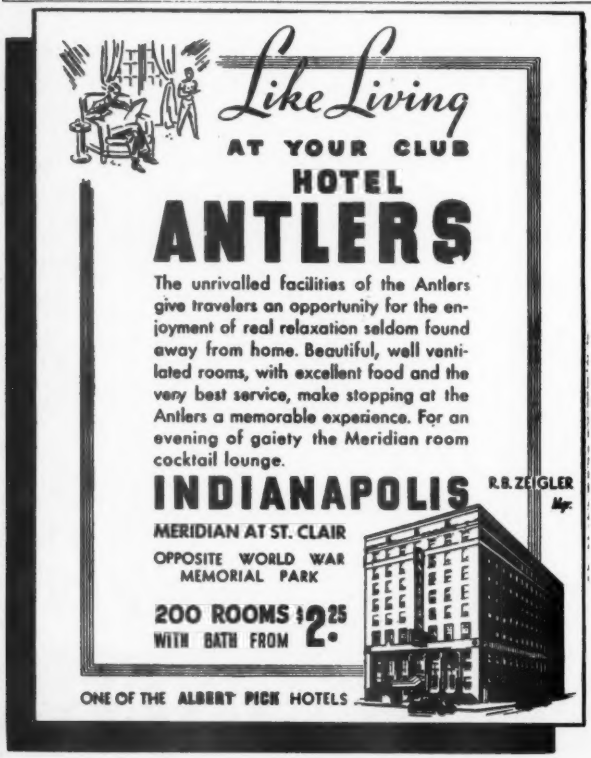
MATCH-IT GEAR CHUCKS are designed to accommodate both helical and spur-toothed gears, either external or internal, during boring and grinding operations. They operate manually with hand wrench or mechanically through the use of the draw bar which is incorporated in many machines. The Match-it gear chucking method in theory and practice is the theme of a new 8-page illustrated catalog published by LEMAIRE TOOL & MFG. CO., Dept. T, 2657 S. Telegraph Rd., Dearborn, Mich. Although these chucks are not intended to be universal, they may be so designed as to take interchangeable gripper plates for a variety of gears of similar size and type. **363-I**

UNIVERSAL TOOL HOLDER—a simple, rugged tool attachment for all general and production work that can be fitted to the carriage compound of any engine lathe is detailed and illustrated in Bulletin UT-3-43 released by the LANE-WELLS CO., Dept. D, 5610 S. Soto St., Los Angeles 11, Calif. Detachable heads fit into a cylindrical tool holder clamped in the tool block. Standard tool bits used for boring, turning, threading, facing, forming, drilling, reaming or tapping are held in the heads. **356-I**

WELDING—DESIGN—METALLURGY—Methods—Cost Analysis—Useful Tools—Helpful Hints—are contained in The Eutectic Welder published to help advance welding applications by EUTECTIC WELDING ALLOYS, INC., Dept. J, 40 Worth St., N. Y. 13, N. Y. This up-to-date "know how" house organ, published monthly, should be of interest to every welder. **81.5-I**

WALES PLATE SET SYSTEM for punching sheet metal is effectively illustrated and explained in Brochure PS just released by the WALES-STRIPPIT CORP., 355 Payne Ave., N. Tonawanda, N. Y. This system consists of Walesite Plate Sets and Wales "PS" Punch Assemblies and Dies which incorporate the following features: simplicity of assembly outside of press, no locating, no adjusting, nothing attached to press ram, punches and dies held in perfect alignment, interchangeable punches, guides and dies and center-to-center distance as close as ½" in any direction. **60-I**

TOGGLE ACTION CLAMPING TOOLS are the subject of an attractive catalog published by KNU-VISE, INC., 1330 Plum Ave., Detroit 16, Mich. Included are photographic reproductions of all Knu-Vise clamping devices, a brief summary of their physical characteristics and line drawings of each model. Knu-Vise fixtures can be pre-set for the pressures demanded by the work at hand. Once set, the pres-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The unrivalled facilities of the Antlers give travelers an opportunity for the enjoyment of real relaxation seldom found away from home. Beautiful, well ventilated rooms, with excellent food and the very best service, make stopping at the Antlers a memorable experience. For an evening of gaiety the Meridian room cocktail lounge.
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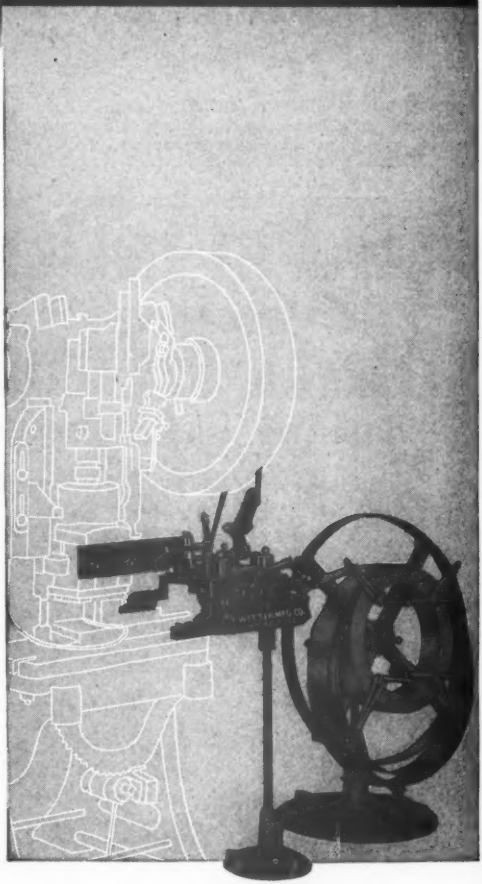
200 ROOMS WITH BATH FROM $2.25
ONE OF THE ALBERT PICK HOTELS

Our Punch Presses Are More Flexible And Productive With WITTEK *Automatic* Roll Feeds And Reel Stands

Manufacturers of metal stampings facing problems in the feeding of coiled strip stock to punch presses will find that Wittek Automatic Roll Feeds and Reel Stands conserve man-hours and achieve new high production levels.

Providing an improved and simplified method of punch press operation, Wittek Automatic Roll Feeds and Reel Stands insure rapid, safe and accurate feeding under all conditions. Made in four different types to meet all automatic feeding requirements. Write for complete details. Wittek Manufacturing Co., 4305-15 West 24th Place, Chicago, Ill.



ARMY E NAVY

WITTEK WMCo *Automatic*

ROLL FEEDS and REEL STANDS

For All Makes and Sizes of Punch Presses

sure spindles remain unchanged until the entire job is completed. **649-I**

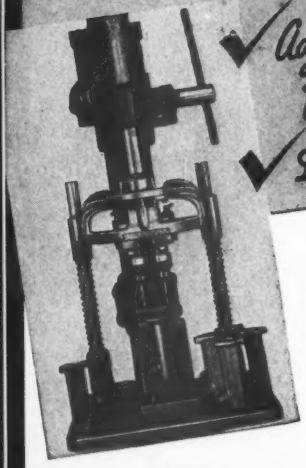
"INLAND STEEL PRODUCTS"—seventh edition—has been published as an aid in selecting the best steel for various requirements by the INLAND STEEL CO., Dept. T, 38 S. Dearborn St., Chicago, Ill. Inland Copper-Alloy is recommended for steel products used in the presence of moisture, whether indoors or out. Inland Hot Rolled Extra Smooth Sheets are desirable when slightly smoother surface than that of Inland Hot Rolled Sheets is required. They are especially well suited for lacquering and synthetic enamel finishes. **335-I**

WEDGELOCK ASSEMBLY TOOLS including fasteners for special thicknesses, anchor nut fasteners, drill stops and combination adapters, speed nut, universal gun pliers, standard pliers, trailing edge clamp and bulb angle clamp are illustrated and detailed in Catalog Unit B released by F & H MFG. CO., Dept. J, 2207 W. Jefferson St., Los Angeles, Calif. Catalog Unit A is devoted to WEDGELOCK sheet fasteners which are unconditionally guaranteed against breakage for one year. The new clutch type reversible wrench which sets an entirely new standard of performance, is illustrated in a supplementary bulletin issued by the company. **716-I**

MACHINE TOOLS including "Bulldog" Precision Milling Machines, Milling Machine Attachments, Conversion Attachments for Lathes, Endless Belt Sanding Machine, Swing Frame Grinding and Polishing Machine and Gyratory Foundry Riddle are presented in an 8-page catalog issued by JEFFERSON MACHINE TOOL CO., Dept. T, 710 N. Fourth St., Cincinnati, Ohio. The Jefferson Gyratory Foundry Riddle is designed for screening, moulding and core sands, also for fine, medium and coarse dry materials. It has a capacity equal to ten men riddling by hand and mixes while sifting. This company is now ready to enter into negotiations with dealers and salesmen for some open territories. **685-I**

HARTFORD'S SUPER-SPACER with attachments and fixtures is adaptable for milling, drilling, grinding, jig boring and slotting at speeds and feeds limited only by the capacity of the holding means and the power of the machine. The Hartford V-Block Milling Fixture simplifies setups for securely holding irregular work. Holding power, speed, strength and accuracy describe the Hartford Four-point Milling Vise which is particularly adaptable to small arms milling. Further information is available from the Hartford Special Machinery Co., Dept. J, 281 Homestead Ave., Hartford 5, Conn. **575-I**

TWO SPINDLE
Adjustable
DRILL HEADS
Drill Two Holes At Once



✓ Adjustable Centers from ½" to 6"
✓ Drill Capacity 0 to 5/8"

Sleeve and overarm types . . . in several sizes. Will double output of any single spindle drill press.

Quickly adjusted to desired drill centers from ½" to 6".

Send for bulletin.

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Taperlock

PLASTIC GAGE HANDLES

MADE of light weight plastic material, Federal Gage Handles are lighter than any metal used, even one-third lighter than aluminum. This lightness permits a most sensitive "touch" with less fatigue in long continued use; an advantage appreciated by women inspectors.

They are highly satisfactory with glass gages; being so much lighter than metal handles, they reduce the danger of chipping and breakage.

Insulating properties help prevent transmission of bodily heat to gages which may affect accuracy.

Marking for identification is accomplished with the same marking tools used for metal gages.

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SEVEN SIZES AND COLORS

00, 0, 1, 2, 3, 4, & 5—in Red, Green, Yellow, Black

FEDERAL TOOL CORPORATION

400 NORTH LEAVITT ST., CHICAGO, ILL.

PUBLICATION REVIEWS

FASTCUT HI-SPEED KEYWAY CUTTERS with their "plus hardened" gunbarrel finish to insure accuracy and long life are presented in a leaflet issued by EMPIRE TOOL CO., Dept. T, 8774 Grinnell Ave., Detroit 13, Mich. These cutters are available in 41 standard sizes from No. 201 to letter G and are contained in a sturdily constructed hardwood box designed especially for this purpose. **554-I**

ENCLOSED HEAD PRECISION BENCH LATHE—with ball bearing spindle and variable drive is detailed and illustrated in a 6-page catalog published by the B. C. AMES CO., Dept. J, Waltham, Mass. The No. EH3 Bench Lathe with a true-turning spindle, wide range of spindle speeds, perfect center alignment, true bed and accurate compound slide rest, will machine small parts with extreme accuracy; do second operation work on parts produced by automatic machines to bring them to final size; it can be used to develop and maintain tools and fixtures; to do model and experimental work, and manufacture small parts with fast operating attachments. Catalog M100 contains information on precision lathes, milling machines, and the Rhodes convertible shaper-slotter. **189-I**

EUTECTIC LOW TEMPERATURE WELDING for use with oxy-acetylene, gas torches, metallic arc, carbon arc, atomic hydrogen, induction, resistance and furnace is presented in a 36-page publication issued by the EUTECTIC WELDING ALLOYS CO., Dept. TD, 40 Worth St., N. Y. 13, N. Y. The quick, free flow of Eutectic Alloys results in extremely thin, smooth fillets that reduce and often eliminate after-machining and finishing thus saving additional man-hours. They are adapted to all metals and every production job. **81-I**

BROACHES—GAGES—MASTER GEARS and Master Index Plates are presented in a catalog of full page illustrations issued by the GREAT LAKES BROACH & GAGE CO., Dept. J, 1015 Franklin St., Detroit 7, Mich., specialists in gear designing and the engineering of form cutting tools. **611-I**

C-MASTER ALL-ANGLE, ADJUSTABLE MIRRORS are detailed and illustrated in a 4-page pamphlet issued by ULLMAN PRODUCTS CO., Dept. J, 857-861 Fourth Ave., Brooklyn 32, N. Y. Their All-Angle Magnifying Lenses, especially valuable for tool or die makers, are designed to aid and speed up inspection and assembly of intricate mechanisms—to set up tools on precision machines—to read fine dials, graduations, watches, thread grinders and to detect flaws in finish on small parts, pivots and screws. Send for further information. **874-I**

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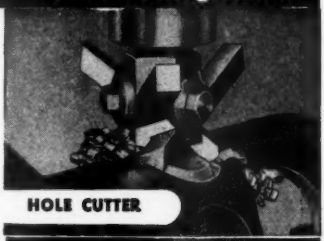

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Export: THE AMERICAN STEEL EXPORT COMPANY, INC., New York, Los Angeles

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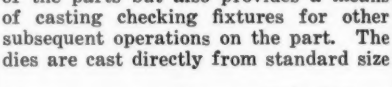

plaster patterns of the part, in a large tank containing circulating, cooling liquid. The cooling of a die is accomplished in approximately 45 minutes. The metal used, a standard, low melting point alloy known as Cerrobend, can be pumped through a long rubber hose to any job that is ready for pouring. Cerrobend does not shrink as it cools and thus eliminates all problems of having to allow stock for machining. Anchor lugs and cores for holding the die in the drop hammer are mounted and cast in place during the pouring. The fitting of templates and all grinding, filing, chipping and polishing operations are unnecessary. The desired thickness of the metal is added to the die by means of a special spraying technique. Aluminum, steel and plastic parts can be made in quantities of from one to fifty or more, depending on the type of material, thickness and accuracy required. This procedure is recommended for accuracy and as a time saver.

Castaloy Corp., 197 S. Waterman, Detroit 17, Michigan. 919-I

SHOP AIDS

and BOOK REVIEWS

ESSENTIALS OF PRECISION INSPECTION, by Wesley Mollard, B. S., Journeyman Toolmaker; Instructor, Machine Shop, George Junior Trade School, Detroit.

This book is a tool-inspection study manual based on the fundamental requirements of precision inspection. Detailed instruction in the use of the various measuring instruments; technical and related information on threads, gears, key slots, etc.; and the procedures to be followed in checking a piece of work to specifications are included. The related information and work problems are arranged in a sequence so that the student may gradually advance from the elementary to the advanced problems while acquiring skill in reading and in the application of the various precision tools. Each work problem introduces one or more new instruments, accessory tools, or procedures by which a problem may be worked. Blueprints are used so as to follow shop practice and allow no gap between the procedure taught and the procedure followed in industry. An outstanding feature is the thorough description of gauges, their principles and applications. The problems are designed to give the student practice in actual inspection.

The author was responsible for establishing the first defense training inspection classes in the Detroit area. The material he prepared was accepted as the course of study by the Army Ordnance Department. Now instructor at the George Junior Trade School, Detroit, he is a master mechanic with 17 years of experience in the toolmaking industry. The material has been tested by use in the author's classes during the past two years.

The specific coverage of the text is best indicated by the several chapter titles: Inspection Tools and Gages; Rules; Micrometer Calipers; Vernier Gages; Checking Holes; Knurling—Carburizing—Sandblasting; Gage Blocks and Attachments; Sine Bar; Milling Cutters—Key Slots; Threads; Problems; and Gears.

Published by McGraw-Hill Book Co., Inc., 330 West 42nd St., New York 18, N. Y., and priced at $3.00.

AIRCRAFT SHEET METAL WORK, by Clarence Allen LeMaster, Member United Air Lines Supervisory Staff. This new how-to-do-it book serves as a basic course of instruction for apprentices and other students of aircraft sheet metal work, and as a refresher for mechanics who are more or less experienced in the work of this trade. The general plan of the book is quite different from that of other texts on the subject for it is a plan formulated by the author, after trying many others, which actually works best in the teaching of both beginners and experienced workers the various processes and operations required of an expert sheet metal mechanic in the aviation field. To further increase the how-to-do-it aspect of this book many simple yet practical projects have been included at the end of those chapters which deal with processes. These projects are progressive (from simple to more complicated) in line with the chapter content, and they can be done using few and ordinary tools and but little material. Many instructive pictures showing actual operations in the shop, and an even greater number of drawings, are used throughout the book to illustrate typical sheet metal work and the principles explained. Another very helpful feature is the series of questions or questions and answers that appear in connection with most chapters.

Contents: Hints for Safety and Production; Tools, Files and Their Uses; Blueprint Reading; Measuring and Measuring Tools; Template Layout and Bench Work; Pattern Development for Bends; Rivets and Riveting; Skin Fitting, General Fabrication, Soldering, Brazing, and Welding; Use of Drop Hammer; Assembly, Repairs, Techniques, Projects; Aluminum and Related Metals; Steel in Aircraft Construction; Index; Decimal Equivalent Table.

Aircraft Sheet Metal Work is published by The American Technical Society, Drexel Ave. at 58th St., Chicago 37, Ill., and is priced at $3.75.

DIESEL LOCOMOTIVES—Electrical Equipment, by John Draney. This is a practical treatise on the operation and maintenance of railway Diesel locomotives. The text deals in the utmost detail with the electrical equip-

ment of the Diesel engine, with particular reference to its adaptation and use in railway transportation.

The author, John Draney, has had years of actual experience, having been a locomotive engineer until reaching the retirement age. He is a past president of the United Associations of Railroad Veterans and is in charge of the Diesel question and answer department of the Brotherhood of Locomotive Firemen and Enginemen's Magazine.

Contents: Current Electricity. Principles of a Generator. Ohm's Law. Electrical Power Measurements. Transmission Equipment. General Electric Light Weight Diesel Locomotive. Baldwin-Westinghouse Equipment for switching Locomotives. Electro-Motive Equipment. Alco-G. E. 660 H. P. and 1000 H. P. Diesel-Electric Locomotives. Alco-G. E. Diesel Electric Road Locomotive. 2000 H. P. Equipment. Index.

Published by the American Technical Society, Drexel Avenue at 58th St., Chicago 37, Ill., and priced at $3.75.

THESE ARE YOUR WEAPONS by Howell N. White, Jr., Methods Department, and Trevor Gardner, Methods Consultant, Plomb Tool Co., 2209 Santa Fe Ave., Los Angeles, Calif. Based on job improvements effected by Plomb workers, this 36-page booklet is sponsored by the Plomb War Production Drive Committee. Written in a refreshing, animated yet factual style, the manual poses fourteen pertinent questions relative to job and methods simplification, then engenders thinking out the answers by clever, suggestive sketches combined with unusually effective action photos from the Plomb plant. Can I free my hand of holding? Has my job got rhythm? Is my job set up for drop delivery? Is my work laid out in my normal working area? Can my job pass the balanced motion test? Can I eliminate that boarding house reach? Can my job pass the needle-in-the-haystack test? Are my tools and materials pre-positioned? Can my job pass the keyhole test? Does my tooling have ejectors and quick-acting clamps? Would a foot pedal free one arm for more useful work? Can I produce two or more at one time? Can my operation be combined with another? Do I need a helper on my job? When these questions are analyzed by the help of the examples and accompanying score sheet any job may be readily streamlined. That there is "One Best Way" to do every job is conclusively demonstrated by the application of Plomb's fourteen "Laws of Work" to any job, whether it is firing a torpedo, operating a machine, or

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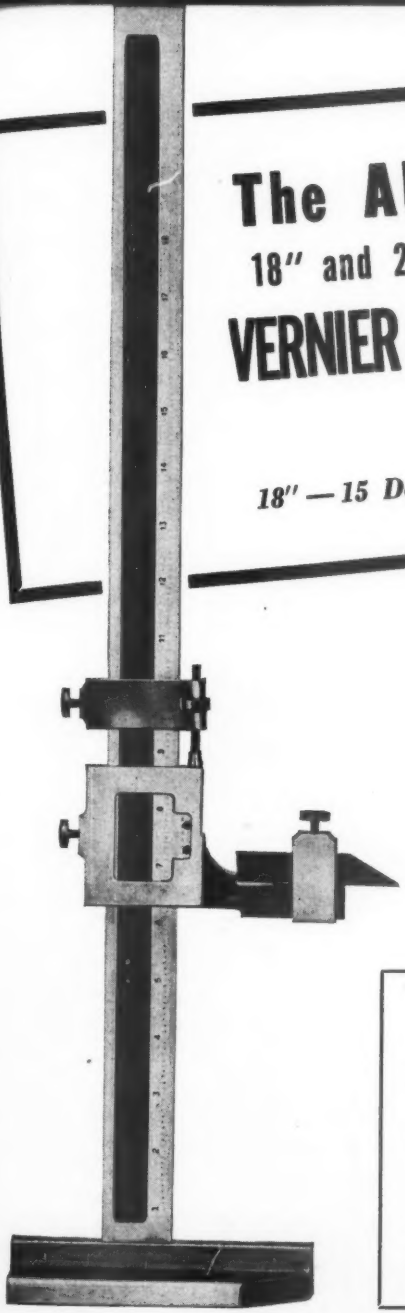

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SUGGESTED SHOP PROBLEMS for Hand Skill Practice in Aircraft and Specialized Sheet Metal Work by I. D. White, is the title of a 104-page, illustrated manual for hand and bench tool metal working.

This practical shop manual contains 60 easy-to-make projects, 78 blue prints, 125 hand tools, bench and floor machinery, and other useful data on blue print reading, sheet metal drafting, layouts, pattern making, precision hand filing, assembly, riveting, etc.

The typical Base Support development project has been especially designed for developing a skill in the mastering of the bending brake and other forming tools. These are illustrated and employed throughout all the suggested procedures in the forming of other parts. The simple instructions given in blue print reading and the other projects mentioned above will be of help in enabling men and women to acquire the industrial skill so urgently needed in the aircraft and specialized sheet metal working industries now and for post-war needs.

Syndicated by The Metal Crafts Guild, P. O. Box 142, Flatbush Station, Brooklyn, N. Y., and priced at $3.50.

FUNDAMENTALS OF MECHANICAL INSPECTION by Rolland Jenkins, Inspection Supervisor, Sperry Gyroscope Company, Inc.

A clearly written, well balanced handbook covering the how and why of inspection. After a review of the purpose and function of inspection, the principles and uses of fine tools and precision instruments are fully discussed and explained. The approach is the result of the author's extensive practical experience supplemented by a long period of classroom instruction in the subject. The necessities of present-day industrial production have placed heavy demands on the nation's man power and woman power, resulting in the induction into mechanical trades of tens of thousands whose background and training have been far removed from such a field of endeavor.

This volume is not offered as a definitive and complete handbook of inspection. It is rather a compilation of classroom discussions

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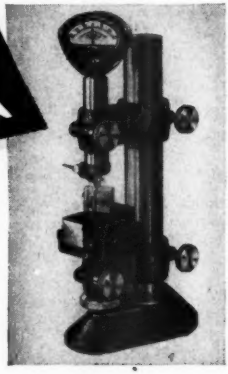

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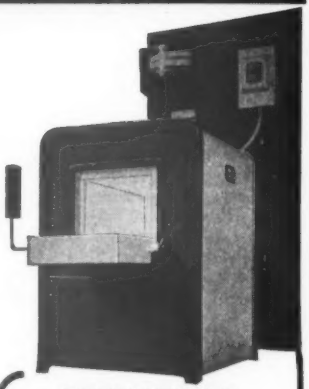

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on some of the more fundamental phases of the subject, wherewith many hundreds of men and women, young and old, have been introduced to and launched upon interesting careers in a highly essential industry. Throughout the country many thousands more will engage in similar work in the near future. The purpose of this handbook is to assist them in gaining a better understanding of their function as inspectors as well as to serve as a ready reference book as they progress.

Published by McGraw-Hill Book Co., 330 West 42nd St., New York 18, N. Y., and priced at $1.75.

"QUALITY CONTROL." is the title of a new pocket size Handbook of Scientific Inspection just being released by Continental Machines, Inc., Dept. T, 1301 Washington Ave., Minneapolis 4, Minn.

The handbook is exclusive and unique in its brief but concise explanation of the entire subject of Precision Measurement. The use of dozens of photographs, diagrams, charts and tables makes its explanation of scientific inspection interesting, absorbing, informative.

Anyone reading its sixty-four pages cannot help but have a working knowledge of this important phase of modern production. As such, its use will be of value to any plant inspection department seeking new ways to establish quality control over their products.

The booklet is dedicated to Eli Whitney, the father of mass production, whose invention of interchangeability of parts has become highly developed through the use of precision measuring instruments to interpret fine dimensions. These measuring instruments are pictured, showing their use in everyday production, safeguarding that production from rejects by establishing uniform control throughout the whole production set-up. Gage Blocks, a host of Gage Instruments and accessories are described, including presentation of the new Mobile Inspection Unit which brings the inspection department right to the point of work.

Of great interest are the many tables and data pertaining to gaging methods used in precision measurement. One section highlights twenty-four subjects vital to precision measuring and explains the use of many precision instruments such as the sine bar, vernier gage, optical flats, etc. At the end of the book fifty-three key questions are given with their answers, serving both as a check and test of the knowledge gained by the reader in studying this handbook. Also offered is a group of films, charts and illustrated booklets as further training aids on scientific inspection which can be secured from Continental Machines, Inc.

BLUEPRINT READING. Understanding Shop Practices, by Fred Nicholson, Mechanical Drawing Instructor, Henry Ford Trade School,

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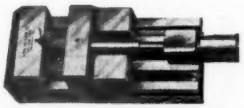

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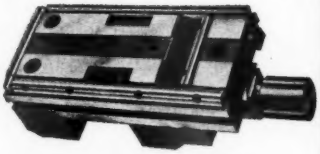

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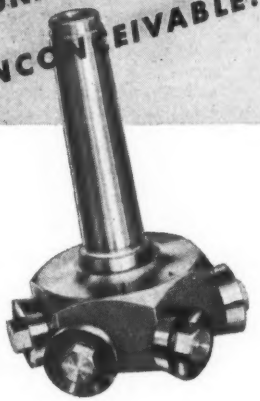

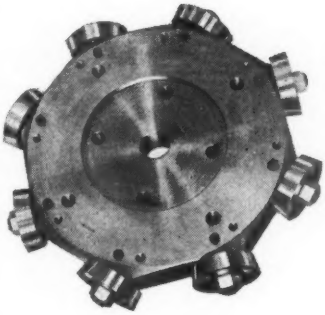

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(Patent Warning: All Micro-Precision and Shearcutter Tools are protected by patents, patent applications or by patents pending. Infringement will be vigorously prosecuted.)

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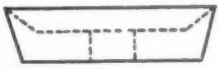
CROSS-SECTION OF  CIRCULAR SHEARCUTTER

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and Fred Jones, Head of Drawing Department, Ford Motor Co. Apprentice School.

In writing this book, the authors have endeavored to overcome some of the handicaps confronting the teachers of Blueprint Reading. The material and method of presentation are based upon many years of experience in the field of vocational education. During this time it has been found necessary to supplement existing books with other material in order to cover the subject properly. The most desirable method of teaching Blueprint Reading is to show the student how the article that is on the blueprint is actually made by taking him to the shop, showing him the tools, machines, and measuring instruments required for the job, and pointing out how the dimensions are used. Unfortunately, it is seldom that such perfect conditions exist. The next best thing to do, therefore, is to acquaint the student with the tools and shop procedures by showing him illustrations of these things and by giving adequate instruction relative to their use. The main body of this work consists of fifty lessons and fifty blueprints for study. In each lesson, something new has been added. Except for the last plate, each print has been considered as a separate unit. For this reason title blocks have been omitted. On many of the lesson sheets in this book, pictorial drawings are shown in addition to the working drawing. This is not customary, but is done here to help the student to visualize the object shown on the working drawing. Lesson material for sketching and clay modeling has been provided. A brief review of arithmetic has been included in this text. The authors have found that many students are handicapped because of their inability to solve ordinary mathematical problems.

Published by D. Van Nostrand Company, Inc., 250 Fourth Ave., New York, N. Y., and priced at $2.00.

TOOL STEEL TREATERS' GUIDE. Booklet 148-B, published by the Bethlehem Steel Company, Bethlehem, Pa.

Under the stimulus of war production, the use of tool steel has increased enormously throughout the country. Large numbers of men in machine shops, forge shops and elsewhere, who have never before handled tool steel, are now seeking concise, practical information about tool steel and its treatment. This Tool Steel Treaters' Guide has been issued in an attempt to help in filling that need. It is intended as a source of information primarily for shop men, shop and tool-room apprentices, warehouse men and inspectors, who are now for the first time concerned with the selection and working of tool steels. It is an effort to give such men the fundamental information they need in condensed form. It is of course not designed for metallurgists or others who are familiar with the

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PRECISION plus HIGH PRODUCTION on Small Parts

ON EVEN COMPLEX PARTS like this at right . . . HIGH PRODUCTION . . . FINE FINISH . . . HIGH PRECISION . . . Tolerances within ±.0005" on all dimensions are obtained on the Gorton 16-A Precision Automatic Screw Machine using single-point, low cost tools.

Each part is *completed* within the close limits specified in only one operation.

This precision performance on long production runs is made possible by the rigid construction of the Gorton 16-A, one of the heaviest Swiss-type screw machines built.

Wide Range of Work

The Gorton 16-A produces an almost endless variety of short or long, slender parts — diameters .005" to 7/16", lengths 1/32" to 2¾"—complete in one operation.

It does stop turning, generates curves, tapers, back recesses, knurls, chamfers, etc. It centers, drills, slots, threads or taps.

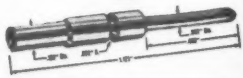
Tool slides are easily accessible. Micrometer adjustments for all tools insure accurate, quick setups at low cost. Centralized fingertip controls provide infinitely variable spindle speeds (1100 to 10,000 R.P.M.) and infinitely variable cam feeds (20 to 720 pieces per hour; 20 to 1440-optional). No speed or feed gears to change.

GORTON Complete Cam and Tool Service

For Any Make Swiss-Type Screw Machine — Gorton or Others

Gorton exclusively offers a complete cam and tool service. Highly skilled engineers are available to take care of all your needs. This service consists of a detailed cam and tool layout, listing all operations of the machining cycle together with necessary cams, tools, collets and bushings. This service is available at the Gorton factory at Racine, Wis., for the Midwest and Pacific areas; and from Russell, Holbrook, and Henderson (our Eastern Distributors) of New York City for quick service in the East.

TOLERANCES ±.0005" ON ALL DIMENSIONS



THIS PART COMPLETED *in One Operation*

IN LESS THAN 9 SECONDS

Toolings: Five flat cams, one bell cam, five cutting tools, one drill, two collets, one bushing.

OPERATIONS

1—Center for #49 drill.
2—Turn .103" dia. and form 54° angle. Drill #49 dia. hole .281" deep.
3—Form .075" dia. groove.
4—Form 25° angle and turn .062" dia.
5—Form .031" radius and cut off finished part.

Material: .125" Round Free Cutting Brass.

Production: 7 pieces per minute.

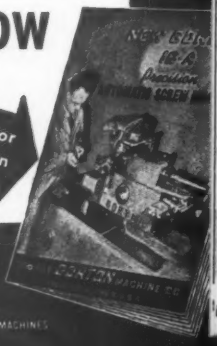
GEORGE GORTON MACHINE CO.
1319 Racine St., Racine, Wis.

GET THE FACTS NOW

Send me, without obligation, FREE bulletin with complete information covering the Gorton 16-A Precision Automatic Screw Machine.

Name.....*Title*.....
Company.....
Address.....
City.....*State*.....

Mail Today for FREE Bulletin



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SECOND AWARD

GEORGE GORTON MACHINE CO.
1319 RACINE STREET, RACINE, WISCONSIN, U. S. A.

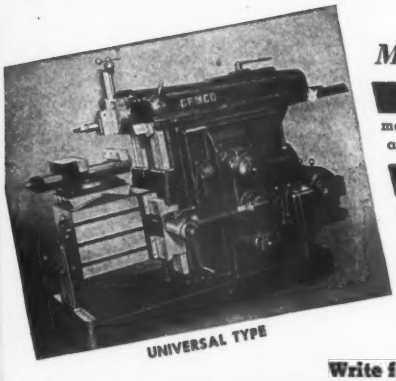
SPECIALISTS FOR 41 YEARS IN TRACER CONTROLLED MACHINES—ENGRAVING, DIE MAKING, VERTICAL MILLING MACHINES

handling of tool steels. It necessarily deals more with the generalities of tool-steel treatment than with treatments for specific steels. The book tells something of how the steel is brought into the condition in which it was received in the tool room, and presents condensed data on the general methods of heat-treatment of the steel throughout the numerous stages involved in developing the finished tool or die. Several pages are devoted to definitions of some of the terms used in connection with steel, and reproductions of heat and temper colors at different temperatures also are included.

Contents: The Making of Tool Steel; General Instructions for Working Tool Steels; Hardening Characteristics of Steel; Nitriding Steels; Tool Steels made by Bethlehem Steel Company; Color charts, Heat and Temper; Sizes and weights of "Superior" hollow drill steel; Definitions of terms used in the steel industry, and useful tables. 116 pages, illustrations, and photomicrographs. **903.5-I**

METCO METALLIZING HANDBOOK, published by Metallizing Engineering Co., Inc., 38-14 30th Street, Long Island City 1, N. Y. This practical, "know how" handbook is published as a successor to the Metco Operation Manual, first issued in 1942, and it contains all the material in the original book plus 30 more pages of new and improved methods. Regularly furnished with Metco equipment, extra copies may be obtained from the publisher for $1.00. This handbook is a most complete and authoritative practical treatise on the metallizing process. The successful application of metallizing is dependent upon technique—not only in the spraying of the metals themselves, but in the preparation of surfaces, in the selection of the correct metallizing wires, and in the finishing of the final job. This technique is demonstrated most effectively throughout the book. The proper procedures as to surface preparation are dwelt upon with great emphasis and detail. Blast cleaning by either sand or steel grit, the selection of proper grit sizes and air pressures are covered with a thoroughness characteristic of the entire treatise. The spraying technique is graphically explained and the reader is familiarized with the tools of the process before the application of the tools is attempted. The proper spraying speed is a most important factor of economical metallizing. The application of corrosion-resistant coatings is extensively treated in keeping with the importance of this phase of metallizing. In conclusion, eleven pages are devoted to the finishing of sprayed metals by machining and grinding.

Matched for the Job!



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GEMCO

Multi-Purpose **SHAPERS**

PLAIN TYPE A fast utility machine for a wide variety of the average shop work and for training purposes in industrial schools.

PRODUCTION TYPE Massively constructed with a large table to handle medium heavy work on a peak production basis with high limits of accuracy.

UNIVERSAL TYPE Ideal for tool and die work, experimental laboratories and model shops or where angular work set-ups are required.

Write for illustrated bulletin GC-12D.

Immediate Deliveries on Firm Orders!

GENERAL ENGINEERING & MFG. CO.

ST. LOUIS 4, MISSOURI

Manufacturers of Precision Equipment SINCE 1917

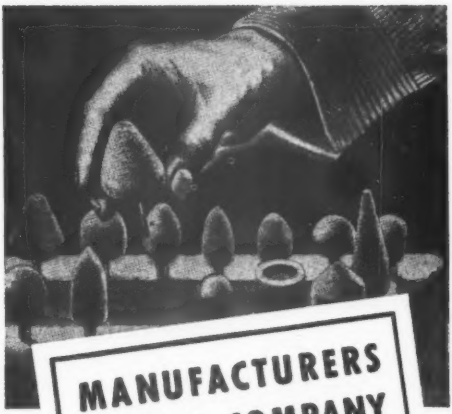
TOUGH But Not BRITTLE!

Safety SUPER-DUTY Set Screw

An unusually strong set screw with all threads die cut — class 3 fit. The sockets are accurately broached, clean and free from grit. The screw is made from special alloy steel, which has been heat treated for maximum toughness, with a tensile strength of 225,000 lbs. to the square inch. The Safety Super-Duty is furnished in any style point shown below.

NATIONAL GRINDING WHEELS

Pay for themselves with longer life, higher grinding speeds and fewer breakdowns. They are investments which pay big returns on production work. Mounted wheels for use in Pattern Shops—Die Shops—Foundries—Auto Body Plants—Plant Tool Rooms—Garages—Rubber Plants—Glass Mfrs.—Textile Mills—Potteries and Home Workshops.



MANUFACTURERS SUPPLY COMPANY
2640 CARNEGIE AVENUE
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SAVE TIME

ON BORING-TOOL SETTING

Take *one* trial cut, mike it, and use this gage to move the tool the exact additional amount required. Or, working from the O.D. of the bar, set the tool to exact position without a trial cut.

USE THE BARTELT PEDESTAL MICROMETER

Time wasted in conventional cut-and-try methods can be eliminated. Inexperienced operators learn to do satisfactory work more quickly. Three models available—Model B, with two-slide pedestal, shown.

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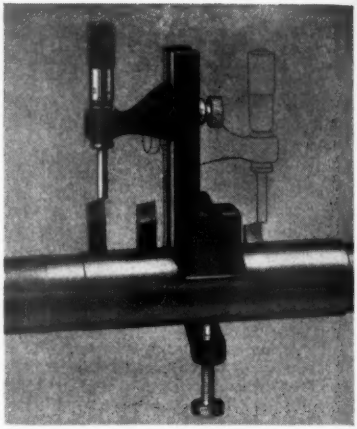
Bartelt Pedestal Micrometers are also excellent for height and depth gaging, for inspection work of various kinds, and for other set-up operations. Write for circular giving full information.



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ENGINEERING COMPANY
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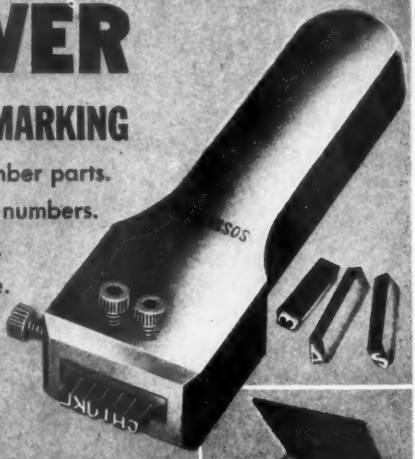
BELOIT • WISCONSIN

TIME SAVER

FOR QUICK CHANGE MARKING

- Fastest and simplest way to number parts.
- Easy! Just turn screw to change numbers.
- Made of best quality tool steel.
- Guaranteed for years of service.
- PROMPT DELIVERIES



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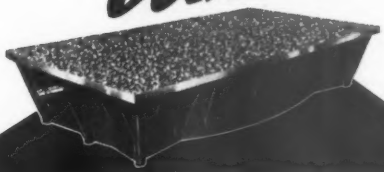

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THE ACROMARKER No. 7
solves nameplate-stamping problems!

AS SIMPLE TO OPERATE AS A TYPEWRITER—FOR NAMEPLATES UP TO 9" x 8" x 2½", DIE SIZES TO ⅜".

★ **For large, heavy work, the ACROMARKER NO. 7 represents one of the most durable and efficient nameplate stamping machines on the market. Replaceable dies, table lock for adjustment, automatic advance for character spacing and double row precision ball bearing die wheel are a few of the extra advantages of the ACROMARKER NO. 7. Write for illustrated literature today.**

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THE ACROMARK COMPANY
515 MORRELL STREET, ELIZABETH, NEW JERSEY

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WRENCHLESS CHUCKS

PRODUCE MORE AT LOWER COST!

Production goes up—and stays up—when Barker Wrenchless Chucks go on the job. These chucks are simple, rugged, self contained units, that require no accessories, or outside source of power.

They are easy to install, and from the moment they are put in use they will deliver speedy, trouble-free service that pays liberal dividends—greater number of parts per hour, and lower cost per unit.

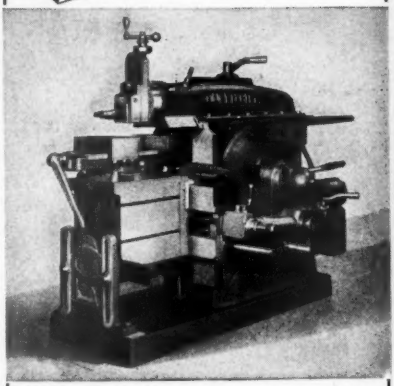
Precision built, they will hold to a tolerance of 1/1000″ either way on round stock of uniform size. And, they will maintain such accuracy during many years of hard service.

Barker Wrenchless Chucks are made in two-jaw and three-jaw types; and as vises for milling machines, drill presses, and similar purposes.

For complete information write for Bulletin No. 201.

THOMAS HOIST CO.
Chuck Division
20 So. Hoyne Ave., Chicago 12, Ill.

NEW!



The 20″ QUEEN CITY
Super Twenty Shaper

The very latest in shaper design and efficiency. This is a heavy, rugged machine equally suited for both the daily grind of heavy production and general tool room work.

The ram is of the V-type of wide bearing; the clutch is the dry multiple-disc type, requiring minimum attention. The feed range is extremely versatile—from .008″ to .191″—easily, quickly changed. A high torque motor for the power rapid traverse is standard. An electrical limit switch in the rail offers complete motor control. **Timken Bearings** are used throughout.

For top performance, speed, versatility, accuracy, and unusual economy, this Shaper will meet with your entire satisfaction.

For full details, write Dept. TD

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FOR CLOSER TOLERANCES IN *Precision* DRILLING

USE *ACME DRILL JIG BUSHINGS*

★ Close tolerances, precision drilling and other rigid specifications must be adhered to in the manufacture of critical war products. And Acme has been helping war industries to meet these requirements by supplying drill jig bushings that assure accurate location of drilled holes.

Wartime demands, however, required no change in manufacturing methods at Acme. The same standards of precision that existed prior to the war prevail today. And during peacetime, Acme bushings will continue to serve industry efficiently in the manufacture of post-war products.

In war or peace, make Acme your bushing headquarters.

ACME

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Hammond ANNOUNCES A NEW

CHIP BREAKER and FINISHING GRINDER FOR CARBIDE TOOLS

Hammond engineers now present to you this new Heavy Duty Chip Breaker and Tool Grinder with all the latest, practical operational features for fast, accurate chip breaker groove grinding and diamond wheel finishing. It features the new Any Angle Vise (standard equipment) that gives you an easy, simple method of obtaining correct grinding angles. ½ HP motor . . . V-belt drive permits the use of any electrical specifications.

Write for complete data, prices and delivery.

Hammond Machinery Builders INC. KALAMAZOO MICHIGAN

1631 DOUGLAS AVE. · KALAMAZOO, MICHIGAN

Eastern Branch: **71 W. 23rd Street - New York 10, N. Y.**

(FROM PAGE 127)

"Continuous Performance" is the title of a new industrial film which skillfully blends important occurrences and dates in history with the significant advances made by The Cooper-Bessemer Corporation in supplying the fast-growing power needs of the nation. The film traces the development of the firm's engine production from its humble "one horse power" foundry beginning 110 years ago to its present position as one of the foremost producers of Diesel and gas engines, compressors and foundry castings.

Cooper-Bessemer Historical Film

Among the highlights of the picture are those scenes which illustrate the company's farsightedness during the late 1920's when they combined with The Bessemer Gas Engine Company of Grove City, Pa., pioneers in the conversion of steam engines to gas, and thus formed the nucleus of the present Cooper-Bessemer Corporation.

The principles of supercharging, an advancement pioneered by the company which permits the engine to burn more fuel within a cylinder and thus greatly increase power output without increasing engine size, are portrayed along with an explanation of Meehanite for which Cooper-Bessemer is the exclusive licensee in the engine field.

This film is now being scheduled by Cooper-Bessemer for extensive showings throughout the country so that government officials, engineers and students can obtain a better knowledge of the company, its policy, facilities and the applications of its engines to the various power requirements for which they are designed.

KNOCK-OUT UNIVERSAL TOOL GRINDERS AND CARBIDE TOOL GRINDERS . . .

Are used the world over. Your plant cannot afford to be without one. Maintenance or production at a minimum time expenditure and capital outlay.

New illustrative literature for you. Write for: Bulletin UTG-43-TD for information on the K-O Universal Tool Grinder... Bulletin CTG-43-TD for information on the K-O Universal Carbide Tool Grinder.

K. O. LEE COMPANY
ABERDEEN SOUTH DAKOTA

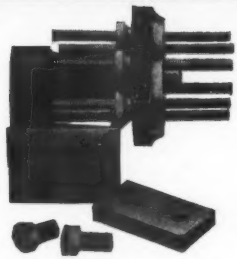
This is a war of science fought by trained young men

"University of War"

who are applying their knowledge to planes and ships. Several thousand men in the armed forces are graduates of General Electric's "University of War" and hundreds more are currently taking the short-term courses in several plants of the company. This information, disclosed in a company statement to stockholders, revealed that Army, Navy, Signal Corps and Air Force men are highly trained in the use and care of complicated war

(TO PAGE 172, PLEASE)

SPEED PRODUCTION
WITH MULTIPLE LATHE STOPS



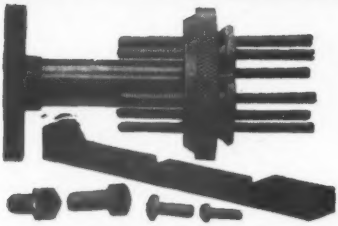
AMERICAN MODEL CS-1

MULTIPLE CARRIAGE STOP

- Sets 6 Stops for Duplicate Operations
- Accurately Gauges Length of Cuts
- Prevents Errors and Rejections
- Any One of 6 Stops Available
- Stops are Numbered and Indexed

Model CS-1 Fits Atlas, Logan, South Bend and Similar Lathes.

$16.75 COMPLETE



AMERICAN MODEL DS-1

MULTIPLE CROSS SLIDE STOP

- Sets 6 Diameter Stops for Repeat Operations
- Prevents Spoiled Work
- Increases Production
- Unnecessary to Work by Dial Graduations

All necessary parts are supplied with each Multiple Cross Slide Stop. Immediate shipment from stock. Rush order and priority today.

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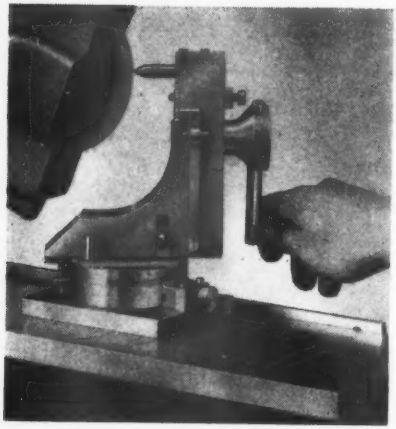

Fluid-Motion Form Dressing

A new radii and angle dresser designed primarily for use in repetitive precision production where extremely precise depths of radii and simplicity of operation are required has been announced by J & S Tool Co. Angles tangent to radius are prefectly blended in one continuous fluid-motion, it is claimed, that leaves the form clean, precise and entirely free of the chattermarks or toolmarks caused by tension and machine vibration when interruptions occur.

Operation is simple. To obtain any one angle simply adjust height of diamond to horizontal center of grinding wheel spindle. Loosen the angle set screw; then with the thumb and forefinger push both stops together so that there is one on each side of the swivel base pin. Then adjust to the desired angle. Tighten the angle set screw and dress the angle by turning the traverse control handle. Any two angles may be obtained by turning the swivel base to the desired angle and pressing down the right hand stop with the fingers. Turn the swivel base to the second desired angle and tighten angle set screw. Recheck before dressing.

For convex radius, obtain the center by setting the diamond and micrometer pins at the same size; then add to the micrometer pin setting for desired convex radius.

J & S Tool Co. will send further details. Their address is: 477 Main St., E. Orange, N. J. 339-I

STRENES METAL IN FRONT LINE OF SERVICE

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Strenes can be cast to shape. Most of the usual machining time is saved. Redressing is reduced. That is why before the war Strenes gained heavily as a forming and drawing die metal. In one case around 2,000,000 stampings were obtained and the die is still in good condition ready to resume operation at the end of the war. Runs of 100,000 pieces up are not uncommon.

Hundreds of the largest plants in the country used it regularly in their tooling programs. Want the names of pre-war users of Strenes?

IN THE WAR

Strenes today is being used for draw pots, draw pot inserts, draw rings for draw bench operation, for progressive upsetting dies . . . all in shell manufacture. Glad to identify all such users and many others.

AFTER THE WAR

After the war, refrigerator, stove, metal casket, grave vault, farm implement and other manufacturers will resume with Strenes metal forming and drawing dies. Many of the automobile, truck and tractor builders are extensive users, for body, fender and hood dies. Will name them to interested inquirer .

Look into the merits of Strenes metal . . . Try it, at least once.

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with *Rawhide* HAMMERS and MALLETS

Coiled Rawhide faces strike effective blows without marring or battering; speed up work; reduce spoilage. Hold true faces—strike accurately. Outlast several ordinary mallets. Reduce bounce and recoil—prevent fatigue. All sizes with light or weighted heads. Write for Catalog.

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"STAR DUST"
LABORATORY GRADED
PURE DIAMOND POWDERS

Precision LAPPING POWDERS
for PRECISION work

GAUGES, TOOLS, DIES, etc. with tremendous TIME SAVING

The following factors have made STAR DUST indispensable in lapping and superfinishing operations on HARD STEELS and TUNGSTEN CARBIDE.

- Absolute control of particle sizes
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- STAR DUST sizes as fine as .0001"
- Complete range of grit sizes

Consult us about your lapping and super-finishing problems.

STAR DUST speeds up production enormously and produces finishes and superfinishes down to less than .0000004 of an inch.

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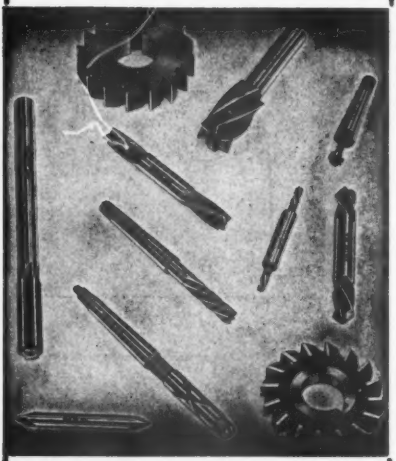
IMMEDIATE DELIVERY
FROM STOCK
On Standard Sizes

GALTER
HIGH GRADE TOOLS



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PROMPT DELIVERY ON SPECIAL TOOLS, DIES, JIGS AND FIXTURES MADE TO YOUR EXACTING REQUIREMENTS

Write for prices on standard sizes or submit blueprints for quotations on special sizes.

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DIAMOND WHEELS

When the war is won—Americans will enjoy higher standards of living than ever before. Motor cars, airplanes, trucks and tractors, home appliances, every machine and tool that's made of metal, will be better, safer and stronger. JKS Diamond Wheels will help to make this possible by processing tougher metals, with greater precision. Far-sighted companies are already designing new products, scanning new outlets and perfecting plans for cutting their costs with improved machine tools. To such executives this is an invitation to write today to—

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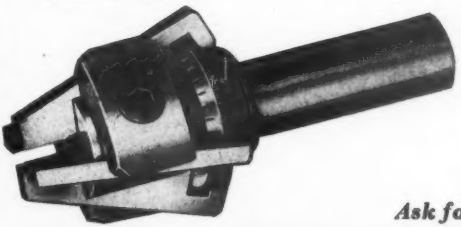
KUTMORE *High Speed*

PROMPT DELIVERY

THE ONLY MILL WITH BUILT-IN MICROMETER DIAL ADJUSTMENT



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4 and 6 Blade Mills, 34 Standard Models, Specials Made to Order.

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Rough Turned or Finished Complete

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Rings, Discs, Blocks, Shafts, Hubs, Bars, and Special Shapes.
Tool Steel of all Makes

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STAINLESS & COPPER FORGINGS

May We Serve You?

AJAX STEEL AND FORGE Co.

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BURKE
MILLING MACHINES

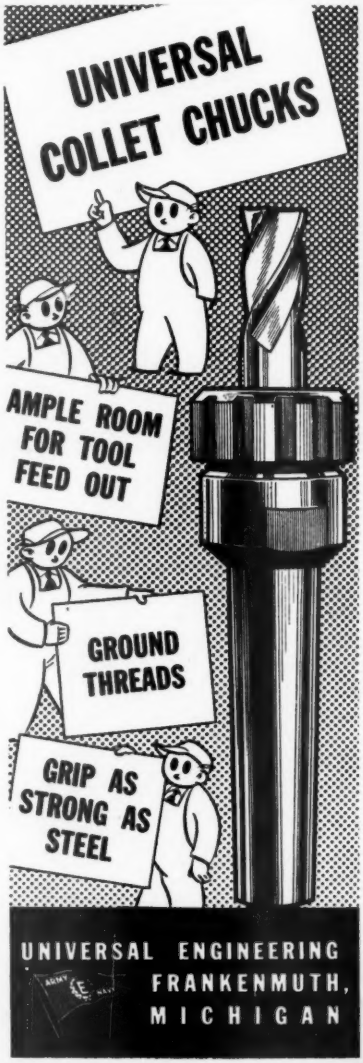
No. 4 Motor Driven MILLING MACHINE
Mounted on Cabinet Column

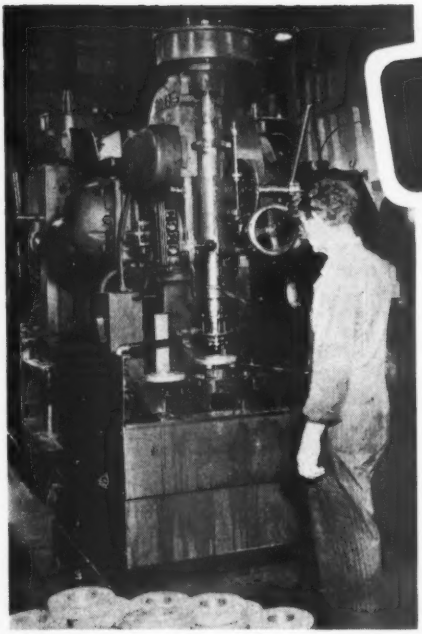
Burke motor driven milling machines Nos. 1, 2, 3, and 4 are specially suited for handling small, difficult work on a production basis.

Write for complete information.

Burke Machine Tool Co.
301 E. 16th St. -:- Conneaut, Ohio

Mr. J. P. McShane, of Swift & Co., has been appointed a member of the ASA Committee of Pipe Flanges & Fittings. Some of the more recent standards approved by this committee are Cast Iron Screwed Drainage Fittings (B16. 12-1942) and Ferrous Plugs, Bushings, Locknuts and Caps with Pipe Threads (B16.14-1943).





BAKER

MAKES ANOTHER CONTRIBUTION TO THE WAR EFFORT

Urgently needed steel flanges produced on high production equipment, using standard single spindle Baker Heavy Duty Drills. Model 217, illustrated, uses receding type taps for tapping flanges, sizes 1½" to 4" taper pipe tap.

The spindle is arranged with positive thread lead attachment, insuring better character of thread. Simplified fixture design; flanges located over previously drilled holes and a minimum operating effort permitting one man to handle two machines are some of its important features.

BAKER BROS.

TOLEDO, OHIO

HERMAN

PRECISION GRANITE

Patent Pending

SURFACE PLATES

Distinctly New . . . . Definitely Superior

Herman PRECISION GRANITE Surface Plates eliminate once and for all the disadvantages and uncertainties of old-fashioned metal surface plates. Cut from solid granite, they cannot warp and will remain accurate to 1/10,000 inch overall. Practically non-porous, they do not become charged with tool damaging abrasive particles. Corrosion and rust-proof, they are as nearly indestructible as man and nature can make them. Already scores of shops throughout the country have declared them unequaled for precision work. Let **Herman** PRECISION GRANITE Surface Plates increase production efficiency and economy in your shop. Write today for information.

STANDARD SIZES and WEIGHTS

12" x 18" — 75 lbs.	20" x 30" — 275 lbs.
18" x 24" — 160 lbs.	24" x 36" — 480 lbs.

Custom Sizes on Request. Prices are Reasonable.

THE HERMAN STONE CO.

1243 Leonhard Street, Dayton 4, Ohio

(FROM PAGE 164)

equipment and that graduates of these special war-training courses are already on duty in England, Hawaii, Africa, India, and on the seas.

"Today," the statement pointed out, "the company maintains an electronics school (Schenectady); a turbosupercharger school (Lynn); an aircraft armament school (Schenectady); and a handful of distinct Navy schools (Schenectady, Syracuse and elsewhere) in destroyer escort propulsion, submarines, minesweepers, maritime service, naval gun control, searchlights and floating drydocks. The turbosupercharger school probably has the most widely traveled faculty and student body in the world. Here the man who knows the latest word in actual battle conditions is today's teacher."

The need for men who understand the significance of electronic warfare is urgent. The G-E electronics school was set up in Schenectady at the request of the U. S. Signal Corps, which nominates the students. Here were taught the fundamentals of theory and operation for radio and other electronic equipment.

Ph.D's and boys who never finished grammar school, electrical engineers and office workers make up a typical class at the Schenectady aircraft armament school. This is one of the toughest grinds in the University. Computers, fire interruptors, systems of aircraft fire control, other aircraft equipment which is critical, revolutionary, and highly complex are devices studied.

Students in the "University of War" consist of men in uniform of all ranks; civilian employees of the armed services; employees of aircraft manufacturers and other contractors; and G-E personnel—but they fall generally into two classes. In the Navy schools, such as that for the destroyer escort men at Syracuse—one of whose classrooms is the U. S. S. Knox, only land-installed propulsion turbine engine room in the world—complete crews of officers and non-coms are trained as a unit and assigned to a ship.

The instruction materials which feed and nourish this ambitious educational program are of surprising magnitude. General Electric furnishes, for most of the war devices it builds, an instruction book to accompany the device, a repair and overhaul manual, and a parts catalog—the latter two going to bases and

(TO PAGE 176—PLEASE)

Reduce costs and improve quality with this TRIPLE-PURPOSE Machine

A versatile bench type machine for all three major production steps in the die-making process—sawing, filing and stoning. Quality built throughout to stand up longer and produce more accurate work. Forced-feed lubrication plus hardened and ground shafts running in bronze bushings combine to minimize wear and prolong life. Maintained accuracy is secured through holding chuck and clamping device which provide positive file alignment, and balanced moving parts which operate without vibration. *Write for descriptive literature.*

ILLINOIS TOOL WORKS

Manufacturers of Metal Cutting Tools and Shakeproof Products

2501 N. Keeler Avenue Chicago, Illinois

SMALL IN SIZE . . . BUT BIG IN PERFORMANCE

No need today to schedule those fussy little jobs in busy toolrooms on heavy, expensive, high rated machines. The versatile

LINLEY HIGH SPEED VERTICAL MILLING AND JIG BORING MACHINE

is a compact, precision model designed for accurate die and jig making, metal patterns and model making, milling, drilling and reaming.

Eight spindle speeds to 4250 r.p.m.; direct micrometer setting to eliminate pencil figuring errors; counterbalanced quill to remove backlash; and a large capacity for a small machine. Table size 7″ x 17½″, floor space 18½″ x 20″. A precision machine in all respects . . . . a profit maker at all times.

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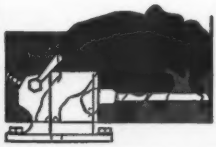
Announcing

MEAD MIDGET AIR CLAMPS

Horizontal and Vertical!



Both models deliver 80 lbs. pressure on a line pressure of 100 lbs. They'll save countless man-hours in assembly operations involving welding, riveting, bolting, etc. *Advantages over mechanical clamps:* 1. Any number can be operated by single master valve. 2. Easily installed in cramped corners. 3. Equal ram pressure at any stroke point. Send for new Mead AIR POWER Catalog, describing our line of Air Clamps, Air Vises, Air Presses, Work Feeders, Valves, Controls, etc.

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CASE HISTORY

This single Kold-Hold Sub-Zero machine handles the output of expansion fit cylinder liners for four furnaces. Double the capacity of former equipment.

*Productioneered

BY KOLD-HOLD

Typical of Kold-Hold "Productioneering for Industry" is this experience of a large automotive and aviation manufacturer (name on request).

Faced with a tough, costly bottleneck, Kold-Hold productioneered* a cold processing unit to fit the manufacturer's problem . . . the results were—production per hour doubled, serious bottleneck broken, closer fits attained and distortion eliminated. This is an outstanding Kold-Hold "productioneering" performance.

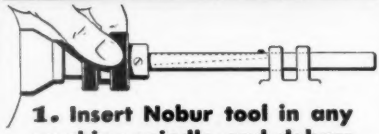
Maybe you have a similar "toughie." A look through our catalog, S-Z 431, may show you a machine that will fit your cold temperature application. Tell us about it and we'll help you "productioneer" your production problem. Kold-Hold machines over a range of from —100° to +200° on capacities from 2 to 400 cubic feet. If pressure and humidity control are required, we have them, too.

KOLD-HOLD
MANUFACTURING COMPANY

*Engineered for Production

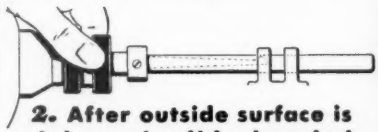
145 GRAND AVENUE LANSING, 4, MICHIGAN

How to deburr holes faster!

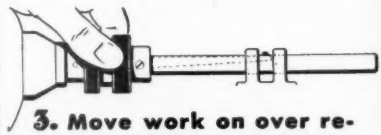


1. Insert Nobur tool in any machine spindle and deburr outside surface of work.

Works like a drill—operator works with complete safety—parts can be burred as fast as they can be handled by operator.



2. After outside surface is deburred, slide knurled sleeve back to retract blade.



3. Move work on over retracted blade and deburr inside surface.

Double-edged cutting blade thus instantly removes burrs around holes in flat or curved surfaces of single or multi-walled parts—smoothly and accurately.

Send for deburring folder. Write

NOTE
All Nobur tools are now furnished with pilot shafts hard chrome plated!

NOBUR MANUFACTURING CO.
912 NO. ORANGE DRIVE
LOS ANGELES 38, CALIFORNIA

CRITERION *Boring Heads*

Original Accuracy *Maintained*

Noted for maintaining original accuracy over a longer period. Criterion Heads are smooth, compact, rigid. Parts subject to wear are hardened. Lead screw is hardened tool steel, with threads ground from solid after hardening. All heads have large, graduated dial. Large offset adjustment eliminates need for offset boring bars. Two sizes: 1½" and 3". ½" and 1" bar capacity. Shanks are interchangeable, enabling operator to use head on different machines. Ideally adapted for slide boring tool holder on small turret lathes. Ask your dealer or order direct. Request free literature.

Lead Screw ground from solid AFTER hardening.

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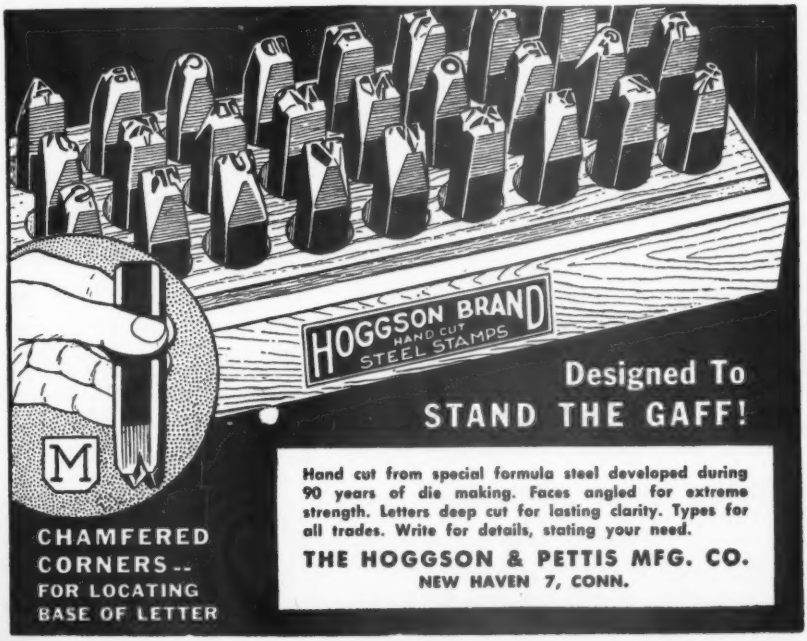
BEVERLY HILLS, CALIFORNIA



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Hand cut from special formula steel developed during 90 years of die making. Faces angled for extreme strength. Letters deep cut for lasting clarity. Types for all trades. Write for details, stating your need.

THE HOGGSON & PETTIS MFG. CO.
NEW HAVEN 7, CONN.

(FROM PAGE 172)

depots. They also supply motion pictures, slide films, wall charts, lectures, and demonstration sets of elaborate design, on such complex items as turrets, computers, gyroscopic devices, automatic pilots, magnetos, turbosuperchargers, amplidynes and dynamotors, voltage regulators, instruments, ship propulsion and searchlights. Lighting engineers at Nela Park provide guides for all branches of the service, identifying every lamp used on a particular ship or vehicle, its application, and replacement instructions.

A concentric alignment gage devised at General Electric's Schenectady Works for a horizontal boring machine quickly centralizes the outer rim of circular pieces for subsequent boring operations. Previously, the alignment check had to be made by securing a bar in the machine spindle and then revolving the spindle.

Concentric Alignment Gage

The gage is clamped to the machine spindle by means of a hinged collar and screw and a metal scriber is positioned

in the mounting block at the end of the offset arm. (An indicator could be attached if desired for this or other possible applications.)

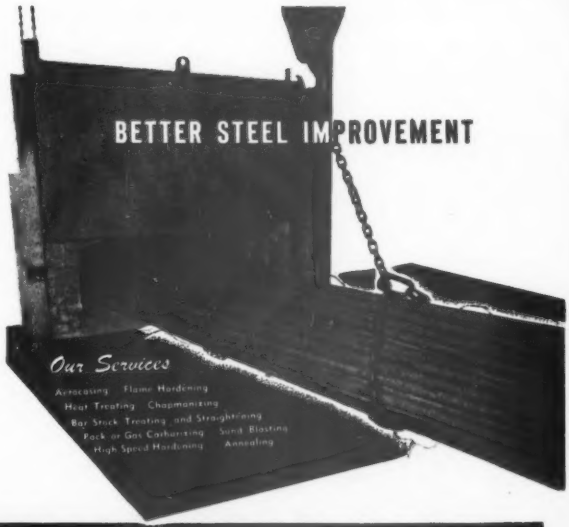
The gage is designed to be used in either of two ways. The spindle gear can be disengaged and the spindle, with the gage tightly clamped to it, rotated by hand or by the "jog" method to check concentricity of the skirt. Or, if preferred, the spindle may be kept in gear and the gage clamping screw adjusted so that the collar or entire gage rotates about the spindle. This gage can be kept constantly on the spindle and always in readiness for final positioning.

(TO PAGE 180—PLEASE)

Delivering to War Industry

Improved Steel

for Better, More Durable Weapons of War



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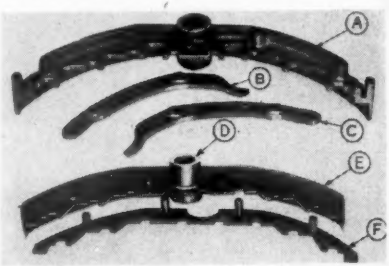
Castings to Stampings

The photo shows a very interesting design of conversion. In many instances a die-cut stamping is superior to a sand casting from a number of standpoints. The physical property of a stamping is more constant, and the material and product are not subject to some of the common variables experienced in foundry practice. If a part can be die-cut, rather than cast, all commercial tolerances are readily adhered to, and duplication is more or less assured throughout the entire lot. On the average casting, allowance has to be made for stock removal in finishing, together with general allowance for shrinkage, warpage and other foundry practice factors. Smoothness and the finish of die-cut stampings is always assured, and final finishing is kept at a minimum.

"A", "B" and "C" represent the castings, while "E" and "F" represent the



two stampings. "D" is a screw machine part. Parts "E" and "F" were produced from a D. R. die, of original design. Part "D" was a screw machine bushing and welded in assembly and included with part "E". A similar part "F" was welded to "E". This meant considerable saving and a more accurate job as to tolerance, and by using a special alloy sheet, much greater strength was produced in the final assembly. It should be noted that initially only three or four hundred of these units were produced a year, but under the Dayton Rogers short run process the blanking tools were produced at a minimum cost, and after checking it was found that the blanking and piercing dies cost less than the pattern, drill jigs and milling fixtures used in producing parts "A", "B" and "C". It was afterwards found that larger production was required, and the preceding development work proved a good basis for building permanent tools, thereby lending the job to mass production which had been considered prohibitive by casting methods.

Address Dayton Rogers Mfg. Co., 2844 12th Ave., So. Minneapolis 7, Minn., for further information. 619-I

BOILER TUBES

In Stock

We stock Pittsburgh Seamless Boiler Tubes, pierced from solid billets of sound steel, with walls of uniform ductility and homogeneous steel structure throughout, all hydrostatically tested. Available in full range of sizes, hot-rolled and cold-drawn, low-carbon analysis or various alloy grades, bent to specification if desired.

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S. E. Steels and Standard S. A. E. Steels, both Carbon and Alloy, Hot Rolled and Cold Drawn · Chisel Steels · Cumberland Ground Shafts · Drill Rod · High Speed Steels Shim Steels · Tool Steels.

BISSETT Steel

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Osborn Wins "E" Pennant

The Osborn Manufacturing Co., Cleveland, O., was awarded the Army-Navy "E" Pennant on February 25th. Maj. Gen. James L. Collins, Commander 5th SC, made the award which was accepted by Osborn president, Franklin G. Smith.

MAKES ALL PRECISION WORK EASIER, FASTER, SAFER

Precision workers all over the country are increasing their production — with greater *eye-comfort, accuracy* and *safety* — by wearing a Magni-Focuser Binocular Eye Loop. Its dual-mounted lenses provide *third-dimensional* vision, and magnify an object to needle-point sharpness. Prisms in each lens relieve eye-strain, and the shade shuts out all overhead and side distractions. Normal vision can be resumed at any time by just lifting the head slightly. *Allows free use of both hands.* Available in four different powers of magnification — either in black plastic or white plastic. $8.50 up, in U. S. A. Order from your Wholesale Supply House or write for name of nearest Distributor.

EDROY PRODUCTS CO., 480 LEXINGTON AVE., NEW YORK 17, N. Y.

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Binocular Eye Loop

CONVERT YOUR ENGINE LATHE INTO A TURRET LATHE IN 15 SECONDS

Photo above shows Jefferson Turrets on 16″ Lathe

CONVERT your engine lathe into a Turret Lathe in 15 seconds, with Jefferson Turret Attachments. To fit bench lathes and lathes up to 24″ swing.

This new modern Tail-stock turret (right) made in 4 sizes to fit small bench lathes and lathes up to 24″ swing. Also the adjustable Pull-Feed lever (not illustrated).

5-Tool Tail-Stock Turret

Pat. Pending

Then there's the completely modernized Tool-Post Turret (right, below) made in 2 sizes, designed to increase production on engine lathes. Easily mounted on cross slide or compound rest. Has capacity of 4 standard tool holders which are easily inserted and rigidly held.

7½″ Swivel Base Dividing Head
IN STOCK — IMMEDIATE DELIVERY
— NO PRIORITY REQUIRED

Turret deliveries 6 days

Jefferson Turrets are real production tools, substantial, rigid, accurate. They must not be confused with the small make-shift gadgets now on the market.

Some territories still open for dealers and salesmen.

4-Tool Tool-Post Turret

JEFFERSON MACHINE TOOL CO.
710 N. Fourth St., Cincinnati, Ohio

Tool-Post Turrets, Tail-Stock Turrets, Adjustable Pull Feeds, Belt Sanders, Gyratory Foundry Riddles, Overhead Swing Frame Grinders, Milling Machines, Dividing Heads and Vises

(FROM PAGE 176)

Also devised at the Schenectady Works is a double indexing fixture which facilitates machining close-tolerance holes at specified intervals about the circumference of a small, round aluminum housing. The housing is composed of an upper and lower section and when the holes, each .503" in diameter, are machined, one-half of each hole appears in both sections. Formerly, this operation consisted of spot drilling and reaming in a drill jig.

Double Indexing Fixture

Special twin boring bars, with drill tips inserted to pilot the boring tool, are used with the new fixture, which is mounted on a channel-shaped fabrication of ¾" steel plate with a bottom side longer than the top. The bottom of the plate acts as a base for holding the indexing mechanism and the shorter top serves as a mount for the work. The upper extension is supported by two posts at each end, as well as by the connecting side of the channel section.

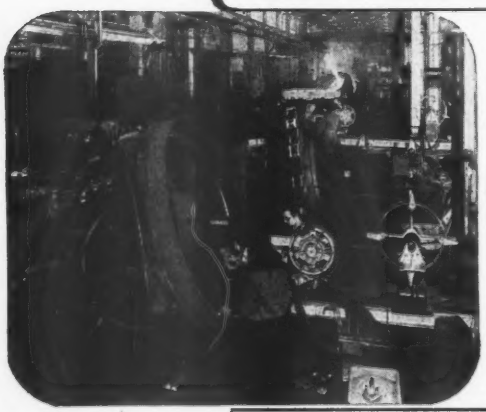
The indexing mechanism consists of a 16-hole index plate assembled to a centered spur gear, at each side of which are gears of equal diameter. The center distance of the shafts, to which the other gears are attached, is within the

adjustable range of the machine heads.

Attached to each shaft is a mounting plate with a short locating pin for each piece. The pieces are positioned over each shaft, the diameter of which per-

(TO PAGE 184—PLEASE)

C-F POSITIONERS



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WELDING

—is possible on many jobs if you have a C-F Welding Positioner. Coming in 6 sizes (capacities to 30,000 lbs.) tables tilt to 135° beyond horizontal and rotate 360°, under push button control. Exclusive C-F Variable-Speed control gives table rotations ranging down to 0 r.p.m. for all sizes.

All C-F Positioners are multi-purpose tools equally efficient on either job or production welding.

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. . . . Strength, accuracy, uniformity, quality, appearance AND the knurled head are responsible for the "Unbrako's" continued popularity. Mechanics prefer the "Unbrako" because they can turn the knurled head farther and faster by hand before a wrench is needed, and knurling also permits locking of "Unbrako" Socket Caps.

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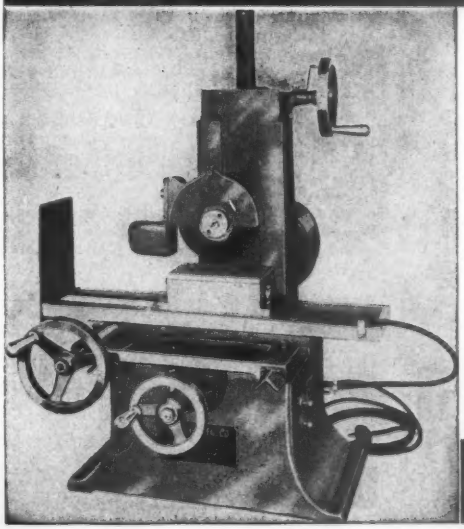
Sanford precision bench surface grinder



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SMALL PRECISION WORK

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TAPS

These high production taps produce consistently more accurately threaded pieces to lower the cost of your tapping operations.

Precision ground from the hardened solid of high speed steel, HY-PRO tap tolerances are held to extremely close limits. *Accurate tapping assures tighter, stronger fastenings that defy vibration!* Specify HY-PRO for High Production.

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Commercial and Precision Ground Thread Taps

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Special Ground Thread Taps

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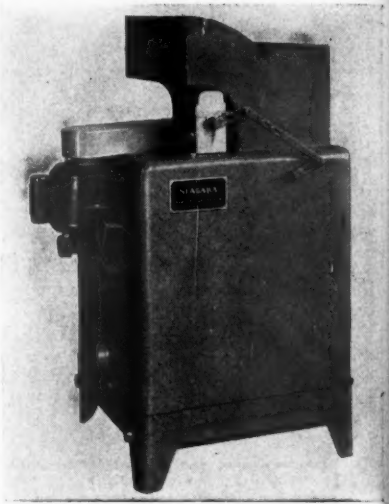

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Other Patents Pending

● Controlled temperature cooling with the NIAGARA AFTER-COOLER excludes excess water and oil from compressed air lines, preventing damage to pneumatic tools and harm to materials on which compressed air is used — as in the cleaning of metals by air blast or steel shot.

The NIAGARA AFTER-COOLER condenses the moisture before it gets into the lines and helps produce compressed air containing only ½ to ¾ as much moisture as air cooled by conventional equipment. At the same time it saves 95% of cooling and jacket water cost, quickly paying for itself. Write for complete information.

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GROUND FROM THE SOLID

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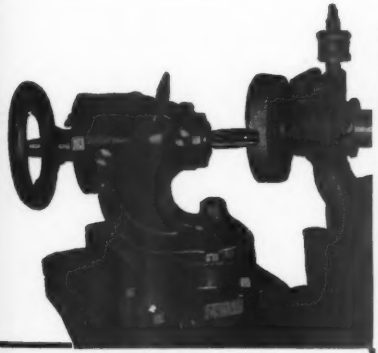

HYBCO CHAMFER SHARPENING HEADS

For Universal Tool & Cutter Grinders

Grind **ACCURATE ECCENTRIC RELIEF on CHAMFERS of TAPS —COUNTERSINKS—CORE DRILLS — STEP DRILLS — Similar tools with evenly spaced flutes.**

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LAY-OUT-DYE

FOR TOOL, DIE, PATTERN OR TEMPLATE LAYOUT ON METAL

LOW IN PRICE

MICHIGAN CHROME & CHEMICAL COMPANY
8350 E. Jefferson Ave. • Detroit 7, Mich.

(FROM PAGE 180)

mits easy loading and unloading. A large flat washer distributes the holding pressure applied by threading a four-winged nut over the end of each shaft.

Each piece is indexed by first releasing a long vertical locking pin extending from the enclosed index plate to the base plate of the fixture. This is done through lever action of the lower attached handle. Next, the upper handle, operated horizontally, in the manner of a ratchet from the center of the mechanism, serves to position each succeeding pair of holes for machining. A pin is inserted in the first hole after drilling and boring as a precaution against possible movement of pieces in the fixture. This method has reduced the time for this operation from 30 minutes to four and one-half minutes. It also results in a reduction of assembly time because of a higher degree of accuracy, uniformity and finish of the holes.

The vastly increased production of cast Meehanite tool shanks, forming tools, and milling cutter bodies at The Cooper-Bessemer Corporation has reached a volume sufficient to release at least 1,700,000 lbs. or 850 tons of critical high tensile steel for producing other vital war material, according to foundry technicians of this pioneer engine builder.

Cast Tool Output Saves Critical Steel

The inability to obtain forged tools for some of their own machining operations, due to the nation-wide shortage of these accessories, influenced the company to utilize their broad facilities and skilled foundry techniques in producing cast tools of Meehanite.

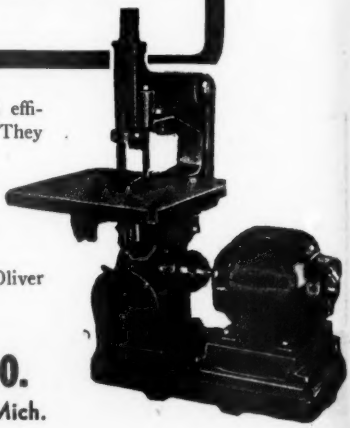
Although the country's steel plants have been doing an exceptionally fine job in stepping up production to meet unprecedented demands, Cooper-Bessemer officials were glad to offer their extensive facilities to help relieve the overburdened condition faced by the steel industry.

(TO PAGE 190—PLEASE)

Filing for Victory

with

OLIVER DIE MAKING MACHINES



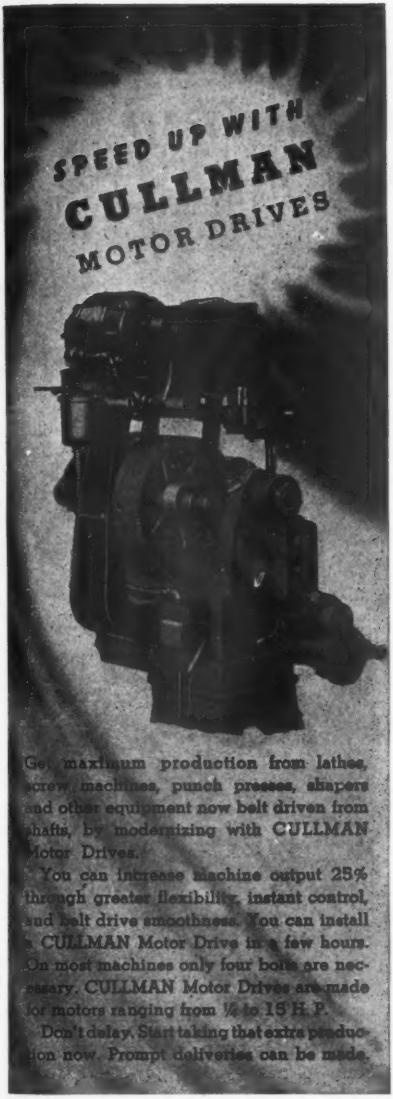
Oliver Die Making Machines are fast and efficient on all sawing and filing operations. They save 50% to 60% of the labor over hand methods in the cost of making precision Dies, Gages, Cams, Templates and similar products requiring rapid and accurate sawing, filing and lapping operations.

It will pay you to investigate the line of Oliver Die Making Machines!

SEND FOR LITERATURE

OLIVER INSTRUMENT CO.

1436 Maumee St., E. Adrian, Mich.



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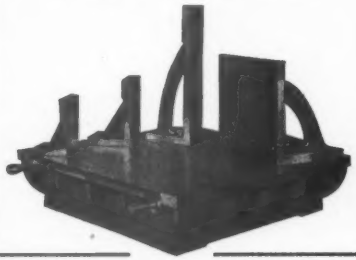

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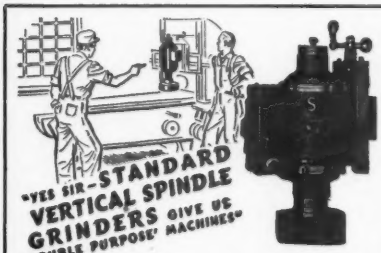

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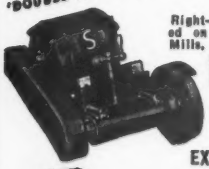

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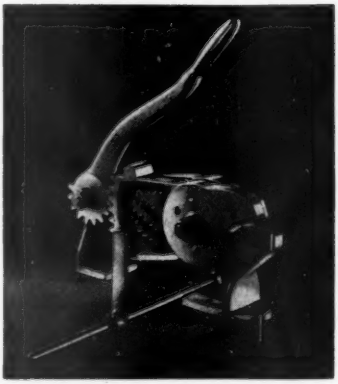

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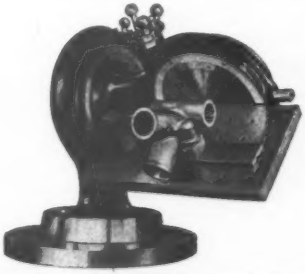

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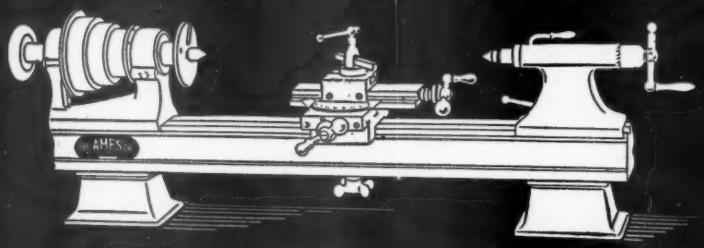

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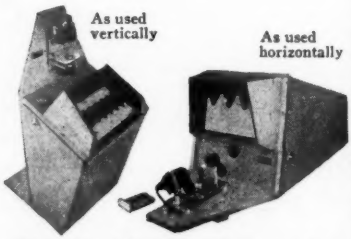

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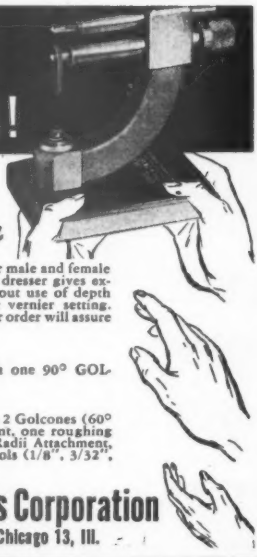

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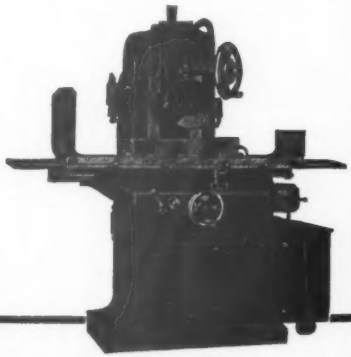

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ASA Briefs

(FROM PAGE 184)

S. O. Bjornberg, Consulting Engineer of the Illinois Tool Works, has been appointed a member of the Sectional Committee on Small Tools and Machine Tool Elements of the ASA.

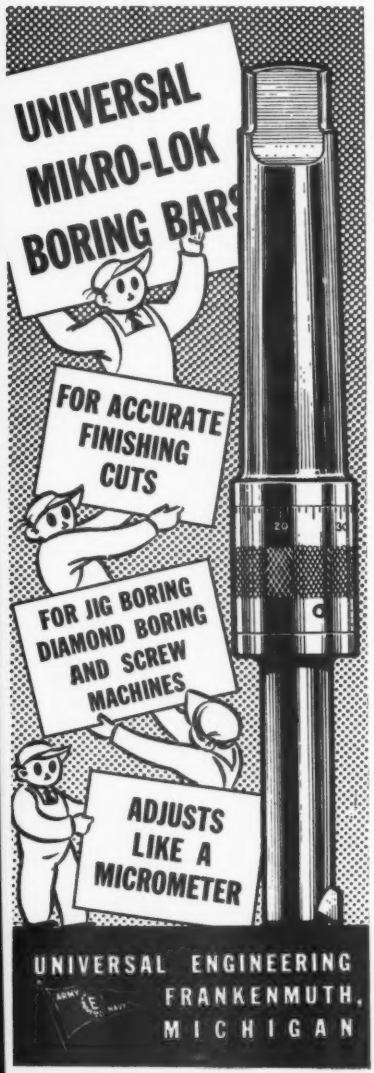
The scope of the committee is the standardization of the elements of machine tool construction and operation, and of tool and work holding elements. It includes also driving mechanisms relating to machine tools on manufacturing operations in mechanical industry; sizes, capacities and clearances of machine tools and work and tool holding parts; length of stroke, travel and other movements and adjustments; parts for holding and adjusting, guiding or aligning work or tools.

The work of this committee is carried on by twenty technical sub-committees. Some of the standards already completed by these committees include: American Standard Milling Cutters (B5c-1930), American Standard Jig Bushings (B5.6-1941), American Standard Circular and Dovetailed Forming Tool Blanks (B5.7-1943), American Standard Chucks and Chuck Jaws for Turret Lathes and Automatic Lathes (B5.8-1936), and American Standard Twist Drills, Straight Shank (B5.12-1940).

For the convenience of users, a new American Standard has just been approved which brings together in one document the various standards covering pipe plugs, pipe bushings, pipe caps, and locknuts used in piping and other piping applications. The new combined standard is known as American Standard for Ferrous Plugs, Bushings, Locknuts, and Caps with Pipe Threads (B16.14-1943).

The sections of the new standard which cover pipe plugs were originally published as American Standard B16e2-1936). This 1936 standard was sponsored by the sub-committee of ASA Sectional Committee B16, which in preparing the standard made use, to a large extent, of material assembled by the Manufacturers Standardization Society of the Valve and Fittings Industry. The proposed standard was distributed by the ASA committee to a convass of industry and the resulting comments and criticisms were considered by the committee before the final draft was completed.

The plugs covered are not only used in connection with pipe fittings but in many other services.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ADJUSTS LIKE A MICROMETER
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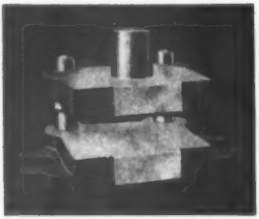

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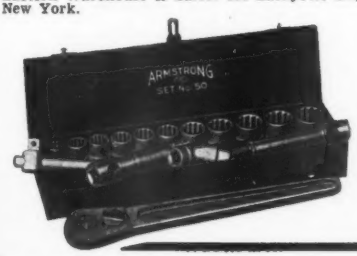

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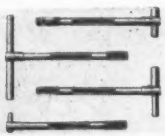
are precision ground—all parts subject to wear are hardened—ground to proper radius.



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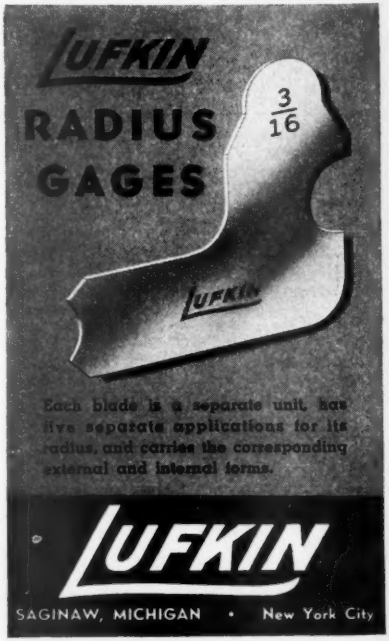
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Each blade is a separate unit, has five separate applications for its radius, and carries the corresponding external and internal forms.
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Temperature control and fluorescent lighting are necessary attributes to the human skills personified by the inspection department of the Republic Gage Company. An intimate picture of their ultra-modern gage making facilities is contained in a technically detailed and generously illustrated 94-page catalog. The inspection laboratory views show super micrometers that read directly in increments of .0001", measuring machines readable to .00001", thread lead inspection equipment incorporating a 15" sine bar for taper thread setups and an optical comparator installation of the largest capacity. Interesting gage making illustrations include Acme thread chasing, grinding and lapping ring gages, and super finishing of cylindrical plugs. In addition to standard gage specifications and classifications, there is a five-page section on gaging practice in text and diagram form. This is followed by sixteen pages of tables and charts of necessary reference data for those working on gaging problems, i. e., table of thread elements, thread forms, basic thread dimensions and tap and drill sizes for the several thread forms, standard taper dimensions, Acme screw thread formula, British Standard threads (American practice) and millimeter thread helix angles.

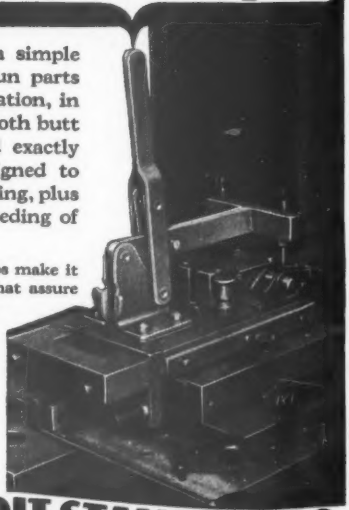
This helpful gage catalog and reference manual may be obtained from Republic Gage Co., Dept. T, 2228 Fenkell Ave., Detroit 21, Mich. 923-I

Movies For War Workers

The Industrial Services Division, Bureau of Public Relations, War Department, offers new official motion pictures including the superb "Battle of Russia", for showing to war workers. This picture is one of the seven "Why We Fight" films shown every serviceman. Other releases are: "Film Communique No. 4", covering combat in three theaters; "They Deliver the Goods" pictures difficulties overcome getting supplies to troops in the Pacific; and "The Case of the Tremendous Trifle", which dramatizes the role of the workers who make small parts. These and other films may be obtained from above Division, The Pentagon, Washington 25, D. C.

Parallel Surfacing with DE-STA-CO Toggle Clamps

Illustration shows a simple jig clamping two gun parts for a surfacing operation, in such position that both butt surfaces are ground exactly parallel. Jig is designed to afford positive clamping, plus quick release and feeding of parts.



De-Sta-Co Toggle Clamps make it easy to build fixtures that assure accurate work and increased production. Used for clamping parts in production and assembly operations. Made in all sizes and types.

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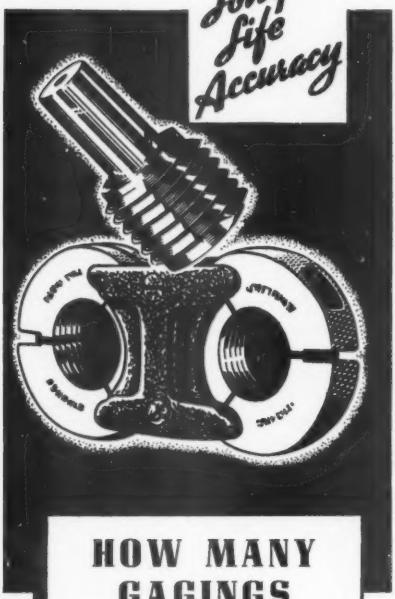

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THE new Aerco multi-grip milling machine chuck has two rows of five collets, hydraulically actuated. When loaded, a few strokes of the hydraulic hand pump supply the necessary pressure for closing all collets simultaneously. Pressures as high as 2500 psi can readily be generated. Work pieces are thus held rigidly in the collets and cannot turn or be pulled out during milling operations. The clamping pressure may be instantly released upon completion of the pass and the self-opening collets can be quickly re-loaded.

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Illustrated literature and specifications obtainable from Aerco Corporation, Hollydale, California. 922-I

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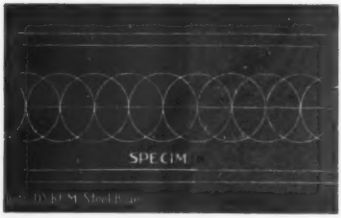

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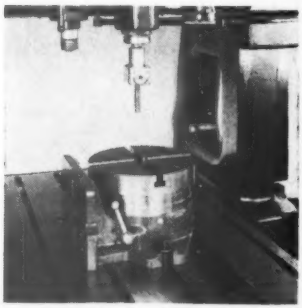

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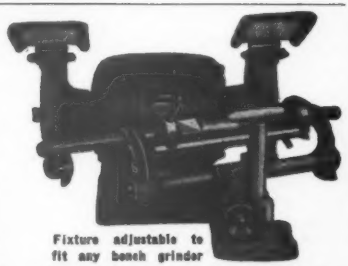

Fixture adjustable to fit any bench grinder

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NEW MAGNETIC HOLDING TECHNIQUES

by E. H. Brandenburg, Pres.
MAGNETIC HOLDING DEVICES, INC.

THE wide possibilities for adapting fixtures for magnetic holding make the subject of holding work magnetically a profitable consideration. Quick and simple setups may be devised that will yield a high degree of efficiency.

With the problems that come to us, the situation is often desperate; something has to be done and done quickly. One case in point was in the aviation industry. A bottleneck had developed in one part. A magnetic tooling method was applied, the bottleneck broken, and at the same time the cost of producing the parts was reduced from $9.50 to $1.75.

The approach to holding work magnetically as herein considered is by means of using one or several electro magnets. One electro magnet, steel parallel and power supply comprise a single or basic unit. Two or more electro magnets with steel parallels may be required for large work or for holding a number of small parts.

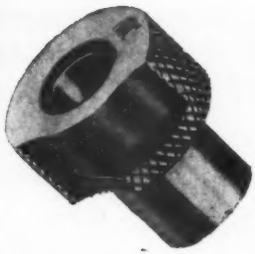
The electro magnet and parallel shown in the illustration form a magnetic chuck. The electro magnet is 10" x 4" x 3½" and the parallel 10" x 1½" x 3½". The electro magnet and parallel are separated by a sheet of brass. Mounted on the electro magnet and steel parallel is a magnetic adapter for holding the work shown. The magnetic adapter is divided into two parts separated by a sheet of brass which is lined up exactly with the sheet of brass separating the electro magnet from the steel parallel. The magnetic fixture is held together with brass studs. The magnetic fixture is also bolted to the top surface of the steel parallel.

This arrangement fulfills the magnetic requirements for holding the work. The flux generated in the electro magnet flows upward through that part of the magnetic adapter resting on the electro magnet and passes through the work to that part of the magnetic adapter resting on the steel parallel. The flux continues downward through the steel parallel, through the work table and back to the electro magnet thus completing the magnetic circuit.

The work that is being held for a grinding operation is a brake shoe. The convex surface of the brake shoe is resting on the magnetic adapter. The method employed for holding this type of work illustrates the idea that if an adapter is "profiled" to fit the contour or shape of the work so that one-half of the work may "receive" the magnetic flux and the other half of the work "deliver" the magnetic flux, the magnetic circuit requirements are fulfilled and a magnetic holding method is established that provides a high degree of holding power. The material used for making adapters is a low carbon cold drawn steel.

The principal difference between the type of magnetic chuck just described and the conventional magnetic chuck, in addition to the unique polar arrangement, is that the voltage used is low d-c voltage which is supplied by a power supply unit that may be plugged into any convenient 110 a-c line. The coils used in the electro magnets require a lesser number of turns than those used in high voltage magnetic chucks. Costly circuit breaking devices which are required on high voltage magnetic chucks to absorb the dangerous inductive kickback are not required on the low voltage coils. A reversing type of switch is all that is necessary to reverse the polarity of the current in the coils in order to demagnetize the work.

(TO PAGE 202—PLEASE)



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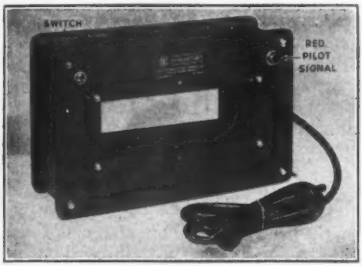

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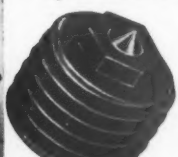

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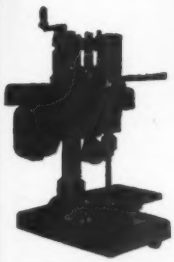

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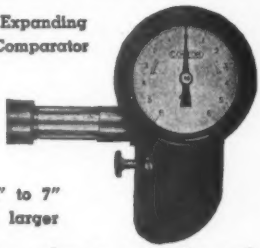

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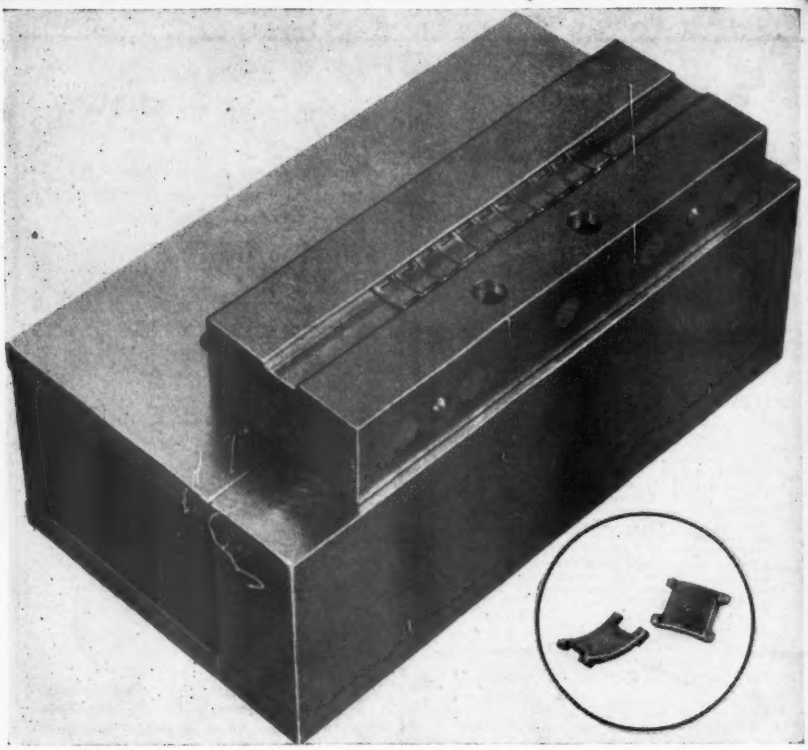

(CONTINUED FROM PAGE 198)

The conventional application of a magnetic chuck is to eliminate the necessity of clamping the work. This, of course, is a primary consideration. Furthermore, work of an unusual nature that does not respond readily to clamping calls for a fixture. Then again there are cases of work as shown in the illustration herewith which makes the tool engineer sit up nights figuring out how he is going to mechanically hold the work. All of these three categories—work that is easily clamped, work that requires fixtures, and work that is difficult to hold even with a fixture—may be handled effectively in a simple and positive manner by the method described.

Holding work magnetically offers attractive possibilities for peace-time production. Today, under the stress of war and urgent demands for delivery, some products are being produced at a high cost. For some companies to remain in business after the war, changes in production methods will be necessary. Production engineers, therefore, may well look into the possibilities of holding work magnetically as a part of the solution to reducing costs.

Some industries have been and are at the present moment studying the application of magnetic holding devices with reference to improving their production. In one industry in particular a young tool engineer conceived the possibility of a magnetic fixture for holding forged steel propeller blades on their planers. He was given encouragement by his chief and devoted much time and study to the idea. After several months, the problem was licked and today there has been made a complete conversion of methods which has resulted in the saving of man-hours, the elimination of the use of matrix metal, the elimination of the use of strategic metal which has been so badly needed during the war, a speed-up of production and a great saving in dollars for the management.

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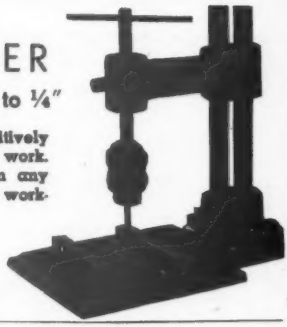
for hand tapping of delicate threads, from #0 up to ¼"



This handy device is precision-built and jig-bored and will positively eliminate expensive tap breakage or spoiled holes on costly work. The lapped spindle and guide assures perfect alignment in any position of the tap. The tapper comes complete with two work-holding jaws and special tap chuck.

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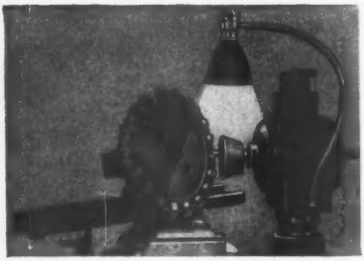

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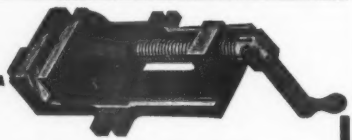

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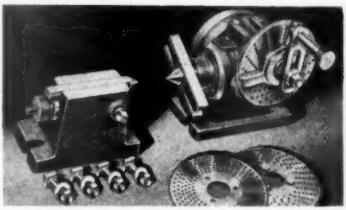

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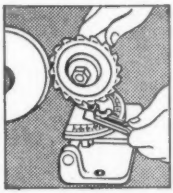

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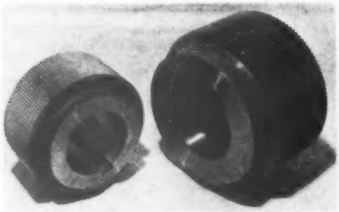

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Table Diameter—6" • Worm Gear Ratio—60 to 1 Bevel Dial Graduated in 1/10 of a Degree • Table Graduated, 360° • Center Hole—⅝" • "T" Slots—⅝" x ⅜"—Two crossing at 90°, forming four quadrants • Height—2⅛" • Weight—14½ lbs. • Price $55 FOB Factory.

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Carbide Tools Speed Aircraft Parts Machining

TWO examples of the utilization of cemented carbide tools for machining aircraft parts on a production basis, recently reported, are of interest to shops that have similar problems.

A Detroit war production plant had an aircraft supercharger gear blank of particularly tough steel which had been originally set up with high speed tools. The blank was machined at a cutting speed of 55 feet per minute. Even at this low speed, the tools had to be resharpened before one piece could be completed. Two passes were required.

The Acme turret lathes on which this job was done were re-tooled with standard styles of Carboloy steel cutting grade 78B single point tools—adapted to the special shapes required for the operation. A cutting speed of 220 feet per minute was easily maintained. The average tool life per grind was 28 pieces, with one pass only required per piece. The machining operations involved on the supercharger gear blanks include facing, turning, boring, chamfering and forming a large radius in the corner of the web.

The Thompson Aircraft Products Co., Euclid, O., had the problem of machining Stellite and steel simultaneously with the same cutting tools on a mass production basis. The part is a special steel aircraft engine valve with Stellite applied to the OD of the head and seat. The part is machined on a Sundstrand automatic stub lathe with front and rear tool slides. The front slide carries a Carboloy turning tool, the rear slide a Carboloy forming tool for finishing.

The valve is held on the stem end by a collet in the work spindle and supported at the head end by the tailstock center. The operator pulls in the tailstock with a handle which locks the tailstock and actuates a switch which starts the spindle as well as the feed of the two slides. Thus the operator merely loads and unloads.

The carbide turning tool makes its cut across both the steel and the Stellite surfaces at the same speed—80 feet per minute. The instant that the tool clears the work, the forming tool comes in for the finishing plunge-cut. Excellent results are reported from this combined operation.

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Kalamazoo, Michigan

HAVE YOU WORK HOLDING, OR TOOL PROBLEMS FOR JIGS, FIXTURES, SCREW MACHINES AND DIES?

The new book, "Tool Design and Tool Engineering," has hundreds of suggested design details with concise, practical information. It contains items of unquestioned value for every executive, designer and shop foreman. Rules and formulas for designing recommended details of Jigs and Fixtures, Dies and Screw Machine Tooling. These are typical pages taken from book. →

The book contains over 400 illustrations thoroughly indexed. Page size, 8½" x 11". 110 pages in all, bound in tough cover of loose leaf design. Every designer will want his own copy. Tool designing and engineering departments can place group orders to take advantage of the low quantity prices shown on page 4. Over 10,000 copies are now in use. A copy will be sent on approval (without obligation, of course) the same day your order is received. Let it solve your design problems immediately—write today.

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The Treasury "Star" Flag marks plants with at least 90% of personnel participating in the Payroll Savings Plan to at least 10% of gross payroll, and also having reached, or topped, a War Loan Drive quota!

The successful close of the 4th War Loan Drive finds many more "Star" Flags than ever before. To these, the thanks of the nation, and the appreciation of the Treasury for a great job. And to those who didn't quite win the "Star", go equally sincere thanks—and may they soon join the "Star" fliers!

One thought that many concerns have found helpful in stepping up their Payroll Savings Plans is this. In many cases the Treasury Representative in a plant has been able to point out that during Loan Drive periods employees found it possible to spare much more than they had counted on, and that—when properly approached—a very substantial fraction of such employees will decide they can afford an increase in their current Payroll Savings Plan.

Talk this over with your Treasury Representative—it offers important possibilities when correctly handled.

LET'S **ALL** KEEP
BACKING THE ATTACK
WITH **WAR BONDS**

The Treasury Department acknowledges with appreciation the publication of this message by

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This is an official U. S. Treasury advertisement—prepared under auspices of Treasury Department and War Advertising Council.

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Accuracy to thousandths . . . . . Yes, even millionths. Our complete inspection laboratory is scientifically air-controlled. The elimination of temperature variations assures positive accuracy to your specification.

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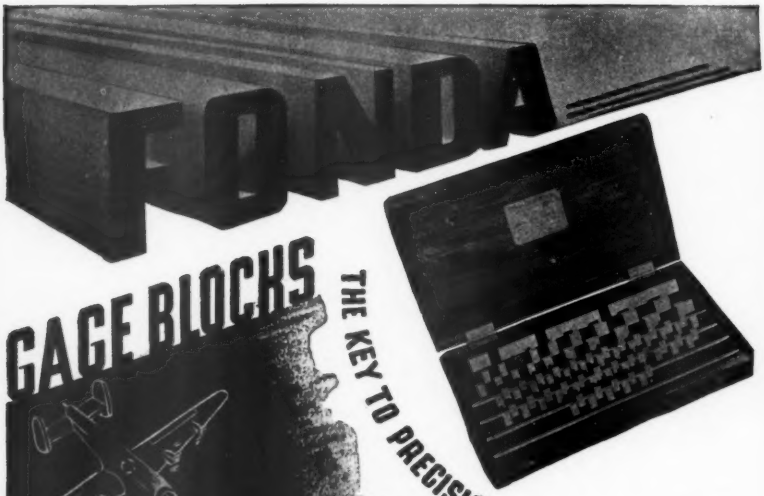
1944



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Thread Milling Hobs—Unground

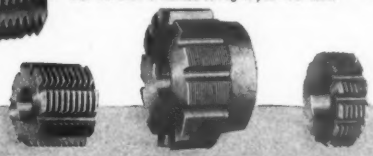
MULTIPLE SERRATION CUTTERS

Specially Developed

UNGROUND Thread Milling Hobs—as produced by MOTOR TOOL—are, within certain limits, matching the performance of GROUND HOBS. In fact, when limits permitted, we have made many that have out-performed the more expensive GROUND types. More pieces per grind. More grinds per hob.

In developing UNGROUND Hobs, it is vitally important to have the correct relief dependent upon work diameters—the degree of helical gash—the correct hardness for the metal to be threaded—whether internal or external threading.

Let us know the nature of the work to be done—the kind of machine in use—and we will design and produce UNGROUND Thread Milling Hobs that will show a marked saving in your tool costs.



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PUSH & PULL ACTION

as opposed to the rotary or spinning type of action, is the secret of the efficiency of this new tool. Because of its short forward and back stroke, accurate work can be done in tight corners or other hard to reach places. It develops a 30 to 40 pound push and pull stroke at the rate of 1000 per minute.

Plug into any 110 volt electric outlet for instant operation. Weighing less than 5 pounds, it is easily handled by man or woman.

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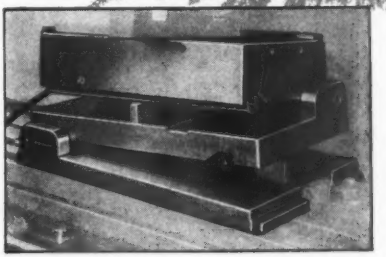
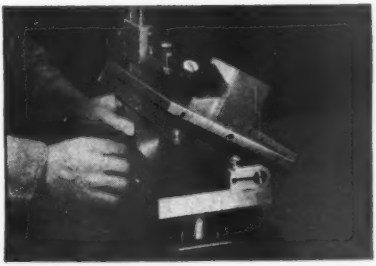
"The Magna-Sine is Really Worth Twice the Price You Ask for It"



The Magna-Sine is available in two sizes in both single and compound angle models.



A non-magnetic sine-plate built on Magna-Sine principles and with Magna-Sine accuracy but without magnets is also available for faster inspection work.

Says a California customer

Recently, in straightening out a case of apparent double payment for a Magna-Sine, a customer wrote to us that he thought the Magna-Sine was worth twice what he had paid for it even though he hadn't actually paid for it twice. We appreciate his comment. The truth of the matter is that twice the price of a Magna-Sine and more can be recovered in a very short time in savings that result from its use.

An angular grinding set-up that requires hours using conventional methods can be completed in a few minutes at the very most with the Magna-Sine. Once the set-up is made correctly it will stay that way since there are no loose pieces to slide under pressure. The part is held securely, but without distortion, and can be released instantly. As a result you get more accurate set-ups, shorter set-up time, less scrap . . . in short, better work at lower cost with the Magna-Sine. There should be a Magna-Sine available for every grinder in your plant that does an average volume of angular work.

ROBBINS ENGINEERING COMPANY

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STEPS UP PRODUCTION OVER 300%!

New Completely Automatic Besly Grinder Speeds Accurate Parallel Surface Grinding

The Besly Vertical, Spindle Grinder No. 953 is the very latest development in machinery for high speed parallel surface grinding. Replacing the older double horizontal spindle grinder which required 5 or 6 passes per part with wheel adjustment after each pass, this new machine grinds the part to .001 inch accuracy for size, flatness and parallelism in one pass per side, without constant adjustment.

How It Operates

Before starting, the grinder is adjusted for the parts to be ground. The stools are arranged so that they alternate high and low, and the operator first drops the parts into the lower stools, where they are held in position for grinding by a clamp. The machine then grinds one side. As the piece comes around to the operator after being ground, he turns it over and sets it on the succeeding higher stool where the other side is ground to a tolerance of .001 inch.

Automatically Compensates for Wheel Wear

The grinder automatically compensates for wheel wear *as the machine is in operation.*

When the grinding wheel needs dressing, merely pushing a button does it automatically—a new feature which greatly reduces maintenance time and saves labor!

Progress in Besly grinder design has been rapid. As a result many new uses for grinders have been successfully developed. Ask us to give you information on Besly grinders for accurate high speed production

MORE THAN 20% OF THE NATION'S "E" HOLDERS ARE REGULAR BESLY CUSTOMERS

Charles H. Besly and Company were awarded the Army-Navy "E" on December 1, 1943, for their production and contribution to Production.

Send for this Booklet on Besly Titan Steelbac Discs—uniform, easy to mount, they speed output.

Charles H. Besly and Co. is pleased to announce that of 1556 holders of the Army-Navy "E" reported through December 1943, 294 are regular users of Besly products.

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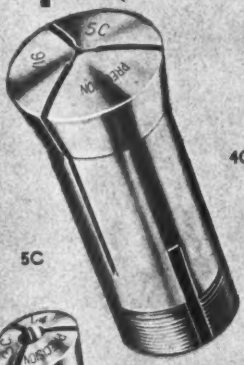

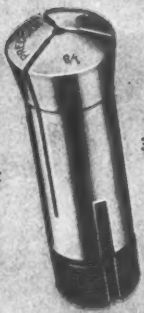

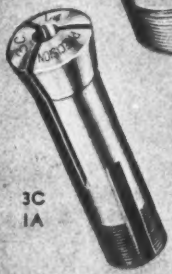

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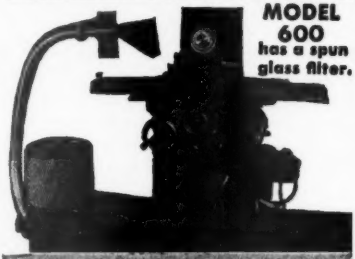
has a cyclone separator.

"READY TO GO" this model is for medium duty work of all kinds.



MODEL 600
has a spun glass filter.

Ideal for light duty production surface grinding.

MODEL 600
Spun Glass Filter

For smallest grinders, laboratory work.

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Handles all the dust from this armor grinding job easily.

Four wheels exhaust into a single Model 1250 that gets all the dust.

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TECO Cemented Carbide is manufactured to rigidly controlled hardness, density and uniformity. Its unusual resistance to wear and breakage prolongs tool life. Cutting edges stay sharp longer—more pieces are produced per grind—less time lost for re-tooling.

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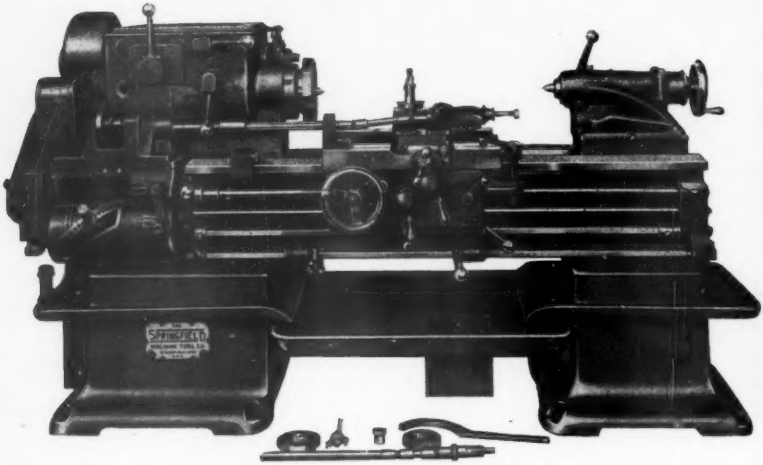
TECO Pioneers in Tungsten Carbides for over a Quarter Century **CEMENTED CARBIDE**

SPRINGFIELD PRECISION LATHE

Out in front!



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Motors . . . V-Belt or silent chain drive.

Bed . . . permanently true—made of high test alloy to resist warp or marring under severe service.

Apron . . . extra heavy—operates on Ball and Bronze bearings throughout.

Taper attachment . . . hair-trigger adjustment.

Compound rest . . . sturdy, firm.

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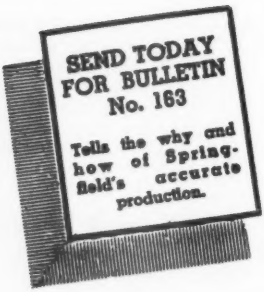
From headstock to tailstock—the SPRINGFIELD Lathe is *out in front!*



THE SPRINGFIELD MACHINE TOOL CO.

SPRINGFIELD • OHIO, U. S. A.

Photos Courtesy Consolidated Vultee

CONSOLIDATED VULTEE

USES 13 MOORE JIG BORERS IN THE LINE

The first two machines of this battery of thirteen entered the San Diego Consolidated plants in the late fall of 1939. In the first four months of 1941, six were added, and the following year five more joined the line. There is no better proof of jig borer satisfaction than a service record such as this, with a producer for whom performance *only* counts in the building of Liberator Bombers.

RANGE: In the boring of holes in jigs, fixtures, dies, gages and special, accurate machine parts, the Moore Jig Borer is highly sensitive for holes of $\frac{1}{32}''$ diameter, yet rugged for heavy cuts up to $4\frac{1}{2}''$. TOLERANCES: Consistently .0002″ and better. COORDINATE LOCATION: By the Moore system of coordinate location, attainable through lead screws ground to an accuracy never achieved before, the operator spots, drills, reams and bores in one uninterrupted sequence.

Partner in Production . . . The Moore Jig Grinder corrects and finishes jig-bored holes on both hard and soft work within .0001″. Let us show you how the Moore Jig Borer and the Moore Jig Grinder will modernize your toolroom operations.

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America's fighting planes, accessories and guns are built to the most exacting standards in industrial history. Split second accuracy is a by-word in weapons vital to Victory and life.

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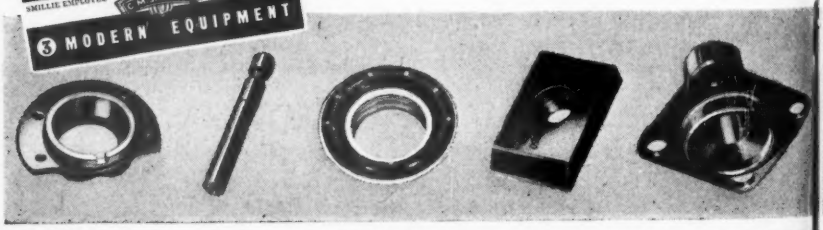
PRECISION PARTS—THE WORK OF *ALL THREE*



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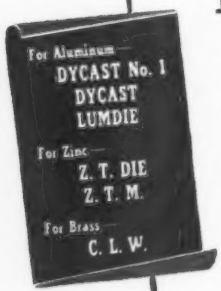

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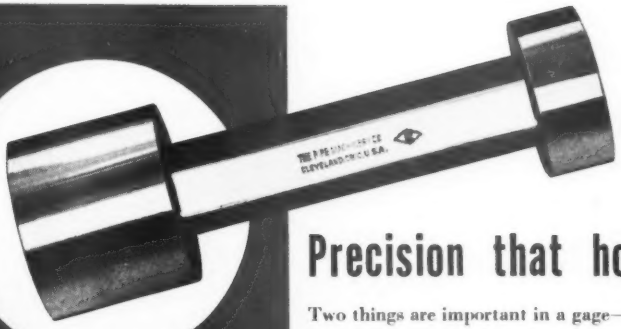

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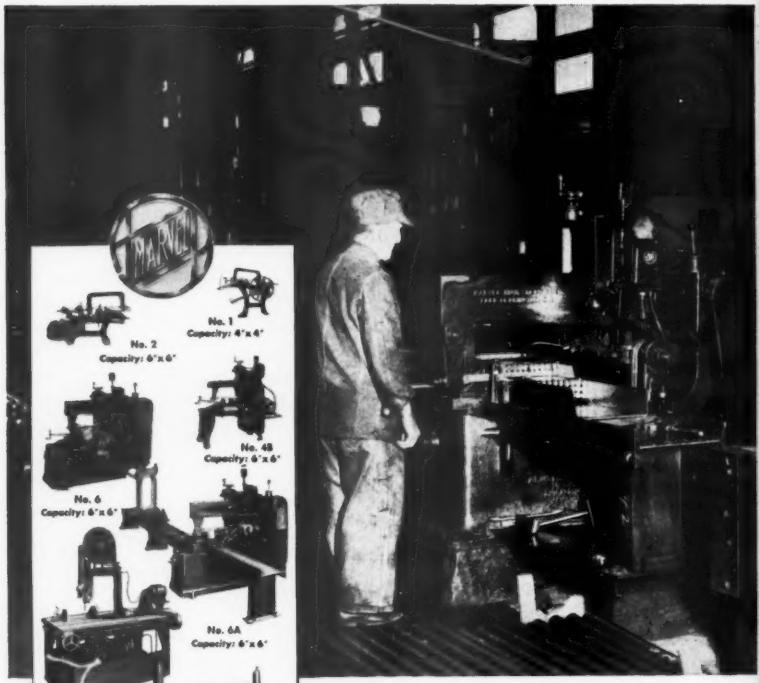

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